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Among the specialties in Medicine, Radiology is the most innovative and evolves the fastest. In the last five to ten years or more, many new technologies were developed and the old improved. For instance, x-ray systems have evolved from films to computed radiography to fully digital. Computed tomography scanners have upgraded from single slice to multi-slice and the most recent is the 256 slice CT scanner. MRI machines moved from 0.3 to 3.0 Tesla. We also saw how the country is slowly shifting from films to filmless technology then to Picture Archiving Communication System. In radiation oncology we moved forward from cobalt teletherapy machines to linear accelerators to combination CT-Linear accelerators. Treatment planning from conventional (X-ray based) or 2D to 3D (CT-based) to IMRT/IGRT/SRS and SBRT. Brachytherapy from LDR to HDR, and from 2D to 3D or Image Guided Brachytherapy planning and delivery. These innovations were developed through researches done by medical practitioners and manufacturers to continuously improve the technology and service to our patients.

Our society can help enhance our daily practice by looking into these new innovations and develop research papers on its applications in the local setting. As radiology is fast evolving, residents and fellows in training will never run out of research questions and finding answers through scientifically crafted and ethically sound studies.

This collection of research papers and abstracts in this journal, the best of 2016, which are the fruits of labor of our trainees or researchers, advisers, reviewers, contest judges and editors. We encourage you to read on and learn from these scientific collection to continue our pursuit for excellence individually or as a society.

Congratulations to the researchers! Great things He has done!
MESSAGE FROM THE EDITOR-IN-CHIEF

It is human nature to ask question and pursue its answer. As a thinking man, the road to wisdom is a path which always fall short; it is most of the times not perfect. But these are the same reasons why we journey to knowledge. We intend to understand and it humbles us. I guess, research is a response to this mortal need. No matter how much we avoid it, still we gravitate to do one in our lifetime. It maybe be simple or complicated. It maybe free or grand. It maybe trivial or mind-boggling. But overall, it can send our sail forward.

In this issue, the short list is consisted of the pre-selected full research papers and abstracts of choice research and case reports which were presented and showcased in the oral and poster competitions during the 2016 PCR Annual Convention. The continuum of daily experience with radiology work and patient interaction led to vast array of topics and cases submitted for consideration and communication. The works included are products of hard work and collaborative effort. The aims are in unison - for advancement of learning. May the readers appreciate the thought.

At present, the reality of half-modernized imaging facilities in most institutions coupled with self-funded researches pose as challenge in completing “ideal” research papers. It is the conscious effort of the researchers to stay conscientious and diligent while doing the investigation that made them come up with valid studies at par with global standards. There will always be obstacles in all roads leading to success. But it is the open-mindedness, resourcefulness, hard work and humility that will keep everyone forward.

Medicine is a changing science and any contribution, no matter how small, can help mankind. Research is a definite avenue of highest potential for progress. Borrowing another’s inspiring words, may I say that, “We have the capacity to change the world; one life or as applicable here, one research at a time.”

LEIZL B. VALERIO, MD,FPCR
Editor-in-Chief
PHILIPPINE COLLEGE OF RADIOLOGY JOURNAL

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OPTIC NERVE SHEATH DIAMETER OF ADULT FILIPINOS MEASURED ON MAGNETIC RESONANCE IMAGING 3D SEQUENCE

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Taft Avenue, Manila, Philippines 1000

ABSTRACT

Objective: To determine the baseline values of optic nerve sheath diameter (ONSD) in adult Filipinos using magnetic resonance imaging (MRI) 3D sequence.

Methods: This cross-sectional, single-center study involved 158 optic nerves of 79 adult healthy Filipinos with normal ophthalmologic evaluation. Using 1.5T MRI machine with a neuroimaging head coil, SPACE sequence of the orbits was obtained. Computer-assisted multiplanar adjustments were used to delineate the optic nerve sheath and the adjacent structures. The diameter of the optic nerve sheath, expressed in millimeters (mm), was measured 3 mm behind the globe.

Results: The range of normal ONSD (mean ± 2SD) in Filipinos is 4.68 ± 1.18 mm, with an average of 4.70 ± 1.18 mm in males, and 4.67 ± 1.85 mm in females, but the difference between sex was not statistically significant (p = 0.8118). However, a statistically significant difference was observed in the ONSD across different age groups (p < 0.001). Compared to neighboring Asian countries, the ONSD values in Filipinos is lower than that of the Chinese population (5.40 ± 1.40 mm) but higher than that of the Korean population (4.20 ± 0.6 mm).

Conclusion: The normal ONSD range in adult healthy Filipinos is 4.68 ± 1.18 mm. This normative value can possibly serve as the baseline diagnostic parameter in diseases such as optic neuropathy, optic neuritis, and elevated intracranial pressure.

INTRODUCTION

The optic nerve sheath diameter has been used in recent studies correlating its measurement with other disease entities that has the propensity to distend the optic nerve sheath at the retrobulbar segment1. The upper limit for optic nerve sheath diameter in adults is 5 millimeters2. However, there are no known local published studies on determining the normal values of the optic nerve sheath in adult Filipinos. It has been shown in published studies the retrobulbar optic nerve sheath diameter has been used as a diagnostic parameter in diseases such as optic neuropathy, optic neuritis, and elevated intracranial pressure2,7,8,9,11. The optic nerve sheath diameter and cross-sectional area of the optic nerve has also been shown to correlate with glaucoma as well as demyelination in optic neuritis or multiple sclerosis12,13,14.

With the advancement of magnetic resonance imaging (MRI), it is possible to delineate the optic nerve sheath with greater accuracy, especially using three-dimensional (3D) sequence called SPACE (Sampling Perfection with Application optimized Contrast using different flip angle Evolutions) (Siemens). A high-field (1.5T) MRI system, available at the authors’ institution, is capable of obtaining such sequence.

The SPACE sequence enables acquisition of high-resolution 3D data sets within a clinically acceptable timeframe, allowing data to be viewed in multiple orientations with optimal image contrast3. In this light, it is possible to measure the optic nerve sheath in a short span of time without the radiation effects of computed tomography scan also used in obtaining orbital imaging.

A. Objectives

General Objective

The main objective of this study was to measure the optic nerve sheath diameter of adult Filipinos using MRI 3D sequence.
Specific Objectives
1. To determine baseline values of the optic nerve sheath diameter in adult Filipinos;
2. To determine the optic nerve sheath diameter at a preselected plane of 3 millimeters behind the globe;
3. To correlate the optic nerve sheath diameter with age and sex; and
4. To compare the optic nerve sheath diameter of adult Filipinos with established normal values in other published studies.

B. Significance of the Study
This is the first local study that aimed to measure the normative values of optic nerve sheath diameter of adult Filipinos using an MRI sequence. For any parameter to be useful clinically in the local setting, the normal range should be known. The normal values of optic nerve sheath diameter in Filipinos will aid in diagnosing and differentiating ophthalmopathies, detecting primary optic nerve pathologies like optic nerve sheath meningioma and optic nerve glioma, as well as serve as a noninvasive method in the detection of increased intracranial pressure.

C. Scope and Limitations
This research involved measurement of the optic nerve sheath diameter of adult Filipino patients recruited via convenience sampling. The measurement of the optic nerve sheath was done at a preselected plane, which is 3 mm behind the globe, using the MRI machine and imaging software available at the authors’ institution.

METHODOLOGY
A. Study Design and Setting
This is a cross-sectional single-center study to determine the normative values of optic nerve sheath diameter in Filipino adults. The study was conducted at a tertiary hospital from February 2014 to October 2014. Participants were chosen through convenience sampling.

B. Study Population
1. Inclusion criteria
The participants in this study were adult Filipinos with ages 21 to 60 years old assessed to have normal ophthalmologic findings as evaluated by ophthalmology residents and fellows in a tertiary hospital. They were selected through convenience sampling, and no randomization was done.

2. Exclusion criteria
Participants with metallic implants, cardiac pacemaker, or other non-MRI-compatible devices in their body were excluded. Those with other significant findings (post-operative changes, mass and other mass effects) were also excluded, together with those conditions that have the propensity to distend the optic nerve sheath at the retrobulbar segment.

3. Withdrawal Criteria
The participant was given the option to withdraw from the study if the patient was unable to tolerate the MRI procedure due to discomfort, noise caused by the magnetic coils, claustrophobia, or unable to tolerate a non-moving supine position during scanning.

Emergency care was coordinated with other units of the hospital in case of occurrence of untoward events.

C. Ethical Considerations
Ethical approval was first obtained from the tertiary hospital prior to the start of the study. The participants were then informed of the scope and objectives of the study. Those who agreed to join the study were made to sign an informed consent form. It was emphasized that participation in this study is purely voluntary, and the subject may withdraw anytime from the procedure.

During the conduct of the study, all records of personal information were kept confidential and properly coded such that privacy and confidentiality were strictly enforced and to avoid accidental disclosure of sensitive information.

The ethical considerations in this study were done in accordance with the principles provided for in the Declaration of Helsinki and the National Ethical Guidelines for Health Research of the Philippines.

D. Sample Size
To determine the sample size required to estimate the optic nerve sheath diameter of Filipino patients using MRI, the following formula was utilized (Eng, 2003):

\[ n = \left( \frac{Z_{\alpha/2}}{\sigma} \right)^2 \frac{\sigma^2}{D^2} \]

Where:
- \( n \) = required sample size
- \( Z_{\alpha/2} \) = critical value (\( \alpha = 0.05 \))
- \( \sigma \) = standard deviation
- \( D \) = margin of error
In a previous study by Shen et al (2010), it was found that the mean optic nerve sheath diameter is 5.4 mm, with a standard deviation (σ) of 0.7 mm. In this study, the confidence interval was set at 95% (α = 0.05), and the margin of error (D) equal to 0.1 mm. Substituting the values,

\[ n = \left(\frac{1.96}{\sigma}\right)^2 \left(\frac{0.70}{0.11}\right)^2 \]

\[ n = 155.56 \approx 156 \text{ optic nerves} \]

Thus, the sample size required was at least 156 optic nerves.

E. Procedures for MRI Imaging and Measurement of Optic Nerve Sheath

The participants lay supine on the MRI table with the head stabilized. They were instructed to close their eyes and relax to avoid unnecessary ocular movements.

SPACE sequence of the orbits was obtained, using 1.5T MRI system (Magnetom Essenza; Siemens AG, Erlangen, Germany) with a neuroimaging head coil. MRI data was transferred to the syngo MultiModality Workplace (Siemens AG, Germany) in the original digital imaging and communications in medicine (DICOM) format.

Computer-assisted multiplanar adjustments were used to delineate the optic nerve sheath and the adjacent structures (Figures 1 and 2). The diameter of the optic nerve sheath was measured 3 mm behind the papilla or globe, because of its demonstrated good reproducibility (r > 0.75, p < 0.001) with mean differences of < 2% of average optic nerve sheath diameter values. All images were reviewed, and only those without motion artifacts were analyzed.

F. Data Analysis

The average optic nerve sheath diameter \( (\bar{X}) \) of the participants was obtained together with the standard deviation (SD). The normal range in Filipinos was expressed in mean ± 2SD. To determine if there was a statistical difference in ONSD between male and female participants, independent T-test was done. On the other hand, analysis of variance (ANOVA) was performed to determine differences in ONSD among different age groups: 21-30, 31-40, 41-50, 51-60 years old.

RESULTS AND DISCUSSION

Imaging modalities such as ultrasound, computed tomography, and magnetic resonance imaging have been used for orbital imaging. Normative data on the orbits using MRI are still limited. To the investigator’s knowledge, this is the first study to be done in the local setting in trying to establish a baseline value for the optic nerve sheath diameter. MRI was used in this study to better delineate soft tissues. With specific MRI sequences, contrast between adjacent structures, including nerves, provides better appreciation of tissue in detail.
Seventy-nine (79) Filipino patients qualified to participate in the study based on the inclusion-exclusion criteria. Out of the 79 participants, 42 are males and 37 are females, with ages ranging from 21 to 60 years old (\( \bar{X} = 39.86 \) years old). Table 1 shows the normative measurement of optic nerve sheath diameter in 158 examined orbits in Filipino patients, compared to the Chinese and Korean populations. Based on the results, the normal optic nerve sheath diameter (ONSD) in Filipinos is 4.68 mm, and typically ranges from 3.48 to 5.88 mm.

The results showed that the value of optic nerve sheath diameter found in Filipinos is significantly lower than the ONSD measured in Chinese population which is 5.40 mm, with a range of 4.0 to 6.8 mm\(^{17}\). On the other hand, the obtained ONSD values in Filipino population are higher than that obtained in Korean population, wherein Koreans are found to have an ONSD of 4.20 mm, ranging from 3.6 to 4.8 mm measured using CT\(^{15}\). This difference in measurements may be due to racial inheritance, and possibly also by environmental influence\(^{16}\). Altogether, these results imply that the optic nerve sheath measurements differ from one population to another, even among neighboring Asian countries, thus highlighting the need to establish normative values which are specific for the Filipino population.

The ONSD measurements in Filipinos were then stratified by sex for comparison. Results showed that in Filipino males, the average ONSD is 4.70 ± 0.59 mm, while in females, the mean ONSD is 4.67 ± 0.93 mm (Figure 3).

<table>
<thead>
<tr>
<th>Race</th>
<th>Optic Nerve Sheath Diameter (mm)</th>
<th>Normal Range (Mean ± 2SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Filipinos (n = 158)</td>
<td>4.68</td>
<td>0.59</td>
</tr>
<tr>
<td>Chinese (n = 160)(^1)</td>
<td>5.40</td>
<td>0.70</td>
</tr>
<tr>
<td>Korean (n = 428)(^2)</td>
<td>4.20</td>
<td>0.30</td>
</tr>
</tbody>
</table>

\( n = \) number of orbits examined; \(^1\)Shen et al 2010, \(^2\)Lee et al 2001

Figure 3. Optic nerve sheath diameter in adult Filipinos stratified by sex.
In order to determine if the ONSD measurements in Filipinos varies with sex, independent t-test was done. At 95% confidence interval, analysis showed that there is no statistically significant correlation between ONSD and sex \( (p = 0.8118, \alpha = 0.05) \). That is, the optic nerve sheath diameter values in the Filipino population are not affected by sex. This is consistent with the findings of Shen et al (2010), wherein they found out that demographic factors such as sex is not statistically correlated with optic nerve sheath measurements.

Table 3 and Figure 4 show the normative MRI measurement of optic nerve sheath diameter in Filipinos categorized by age. Based from the data, it is evident that there is variation in terms of the mean optic nerve sheath diameter, with 4.42 mm as the smallest diameter found in 21-30 age group, and 5.00 mm as the largest diameter in 51-60 age group.

To determine if ONSD measurements are affected by age, one-way analysis of variance (ANOVA) was performed. Statistical analysis revealed that there is a statistically significant correlation between age groups and ONSD \( (p < 0.001, \alpha = 0.05) \). These results are contrary to related studies, wherein they found out that ONSD measurements are not significantly affected by age\(^{15,17}\). This may be due to the low sample size per age group, thus, the obtained values do not adequately represent the population. It is suggested that the number of samples per age group be increased, in order to increase the power of the study as well.

### Table 3. Normative MRI Measurement of Optic Nerve Sheath Diameter in Filipinos stratified by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Optic Nerve Sheath Diameter (mm)</th>
<th>Normal Range (Mean ± 2SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30 (n = 52)</td>
<td>4.42 ± 0.51</td>
<td>3.41 – 5.44</td>
</tr>
<tr>
<td>31-40 (n = 30)</td>
<td>4.83 ± 0.57</td>
<td>3.68 – 5.97</td>
</tr>
<tr>
<td>41-50 (n = 36)</td>
<td>4.70 ± 0.65</td>
<td>3.40 – 6.00</td>
</tr>
<tr>
<td>51-60 (n = 40)</td>
<td>5.00 ± 0.63</td>
<td>3.74 – 6.26</td>
</tr>
</tbody>
</table>

\( n = \) number of orbits examined; SD = standard deviation

![Figure 4. Optic nerve sheath diameter in Filipinos across age groups.](image)
CONCLUSION AND RECOMMENDATION

The use of MRI 3D sequence in measuring the optic nerve sheath diameter showed that the average value for the adult Filipino is 4.68 mm, measured 3 mm behind the globe. Previous studies have shown that the upper limit for ONSD is 5 mm, but recent studies in few of the neighboring Asian countries show that these measurements may vary, attributing differences to race and probably environmental influence. Other studies also used different preselected planes for measuring the optic nerve sheath. This study also showed that optic nerve sheath values are not affected by sex, which is also consistent with other studies. However, this study has found significant correlation between age group of ONSD values contrary to other published studies, and this is due to the low sample size per age group. An established normative value for the adult Filipino population is needed before the optic nerve sheath diameter can be used as a diagnostic parameter in other disease entities related to this structure.

It is suggested that in order to establish normative values of the optic nerve sheath diameter a larger sample size is needed. Different preselected planes behind the globe can also be used as references as other studies have done. There are other MRI sequences specific for the orbit that may be able to delineate the optic nerve in detail, and thus will be able to provide future studies more accurate and reproducible measurements.

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SONOGRAPHIC GALLBLADDER VOLUME CHANGES IN RESPONSE TO ORAL INTAKE OF ALKALINE WATER

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ABSTRACT

Purpose: To determine if there is a significant decrease of gallbladder (GB) volume after drinking alkaline water. A >20% decrease from baseline volume is considered significant. Water intake is advocated for visualization of gastric antrum and proximal duodenum, better evaluation of pancreas and pelvic organs, and to relieve thirst.

Materials and Methods: This is prospective randomized design involving 60 volunteers from Davao City with ages 20–65 years old on nil per os (NPO) for at least six hours. Each with 30 subjects, the control group has no water intake while treatment group drank alkaline water (labeled pH 9.0) at room temperature. Using trans-abdominal ultrasound, the average baseline, 5-minute, 30-minute, and 60-minute interval GB volumes were obtained. Statistical significance and variation of GB volume changes were determined using repeated T-test and Levene’s test. GB ultrasound findings and demographic profile of the subjects were described.

Results: Both group increased the average GB volumes. There was no statistical significant difference in the variation of volume changes between the two. The control group showed statistically significant increase in all time intervals. The greatest increase by 16.51% with statistical significance (p-value .019) was at 60-minute interval of the treatment group.

Conclusion: Oral intake of alkaline water shows no significant decrease in GB volume. GB volume increases whether on NPO or with alkaline water intake. However, intake of alkaline water has additional benefits.

INTRODUCTION

Trans-abdominal ultrasound is often requested for upper abdominal pain and bloating. If the gallbladder is normal, hollow organs such as the stomach and duodenum can be involved, but cannot be properly evaluated when empty or gas filled. Pancreas may be poorly visualized due to overlying gastric or colonic gas. Trans-abdominal gastric hydrosonography which uses non-absorbable solution or water is promoted to help visualize the gastric antrum, proximal duodenum and pancreas[1]. However, requires intravenous anti-peristaltic agent. Common practice for abdominal ultrasound is nil per os (NPO) or nothing by the mouth [2] for at least six hours [3,4] for adequate distention of the gallbladder (GB) and to minimize gastrointestinal gas[4]. GB contraction is strongly influenced by cholecystokinin (CCK) stimulated by eating food containing fat [5,6,7] or protein [7], hence, justifies avoidance of eating.

SIGNIFICANCE OF THE STUDY

To date, there are no published studies stating the effect of water in the dynamics of the gallbladder. Pure water has two molecules of hydrogen and one oxygen. It does not contain fat and protein [8] that may stimulate release of CCK. Drinking water may contain trace minerals like calcium, magnesium, sodium, chloride and fluorine [9], and bicarbonates [9,10]. These elements are not known to cause GB contraction. Other influence to GB contraction is thru vagus due to duodenal acidification [11]. There is no secretion of secretin if the duodenal environment has a pH above 4.5 [12]. Secretin in an acidic duodenal environment stimulates epithelial cells of the bile ductules and ducts to produce sodium bicarbonate-rich watery solution into the duodenum [6]. Alkaline water is being tested in the concept of negative feedback mechanism, that non acidic duodenal content does not stimulate release of secretin. If there is no influence of secretin, the author hypothesized that release of bile from the hepatic bile ductules and ducts would allow storage in the GB rather to be released directly into the duodenum. In order to obtain the benefit of a modified hydrosonography without affecting GB evaluation, this study describes the dynamics of the gallbladder by means of contraction or non-contraction as manifested by
change in GB volume after oral intake of alkaline water compared to the control group who did not drink water. Extra benefit of drinking water is urinary bladder filling for proper evaluation of pelvic organs. It is time efficient because the need for re-scanning of the urinary bladder is minimized. Relief of thirst in a fasting patient also reduces anxiety.

**Review of Related Literature**

In 2003, the randomized study of Sinan and colleagues among patients with Indian and Arabic origin appeared that routine fasting before abdominal ultrasound is not necessary. Typical breakfast of these subjects were light, and is compatible with satisfactory technical outcome for ultrasound few hours later.

The usual maximum volume of the gallbladder is 30-60 ml. Dodds and colleagues stated that gallbladder contractility can be quantified radiographically. Using sum-of-cylinders method is moderately cumbersome. The simple ellipsoid method yields reasonable volume approximation that is comparable to the sum-of-cylinders method with a mean difference of about 1.0 ml. Calculation of GB volume by the ellipsoid method used the formula: Volume (V) = \( \pi/6 \times (L \times W \times H) \), \( V = 0.52 \times (L \times W \times H) \). For both methods of measurement, the intra- and inter-observer error was \( \leq 10\% \).

Study of Donald et al among 30 healthy volunteers shows a wide variation in the degree of the fasting GB volume from 1.9 ml to 45.5 ml and residual volume from 0.1 ml to 21.0 ml and percentage GB contraction from -10% to 99%.

Percentage of GB contraction uses this formula:

\[
\text{Percentage of GB contraction} = \left( \frac{\text{Fasting GB volume} - \text{Residual volume}}{\text{Fasting GB volume}} \right) \times 100\%
\]

In most patients, use of contraction value of 20% as cut-off level to indicate cystic duct patency is recommended.

Sachetti et al. in the study of 402 subjects shows that emptying after fatty meal is faster in men especially ages 21-30 years old. GB began to contract approximately 30 minutes after fatty meal with relaxation of the Sphincter of Oddi in order to release bile.

Fatty meal shows an average of 29 % reduction of GB area which ranges from 0% to 71% among 40 subjects. Maximal contraction occurs after approximately 40 minutes.

Fatty meal sonography is useful in non-invasive screening test for evaluating patients with suspected partial common bile duct obstruction with specificity of 100 % and sensitivity of 74 % according to Darweesh. Fatty meal increases the circulating cholecystokinin which eventually increase bile flow and increase the diameter of the common bile duct, hence facilitates visualization.

GB contraction is less stimulated by vagal acetylcholine secreting fibers. This is supported in the study of Naruse et al among dogs that stimulation of the vagus nerve does not lead to evacuation of bile and even vagotomy caused increased fasting volume of the gallbladder. Spontaneous contraction of the GB is induced by duodenal acidification, is mainly dependent on vagi. Furthermore, in the study of Hahn et al last 2000, GB volume increased significantly in gastrectomized group who undergo truncal vagotomy.

Secretin is secreted by S-cells in the duodenum in response to the acidic environment of the duodenum when the pH ranges from 2.0 to 4.5. It influences bile duct cells to produce bicarbonate and water rich secretion which increases the bile volume. The secretin cannot be released when duodenal pH is 4.5. According to the reference study of Sutor and Wilkie, normal subject’s bile pH ranges from 6.5 to 9.0, and pH of 6.9 to 8.0 among patients with gallstones.

Hydrosonography of the gastrointestinal tract (GIT) using luminal contrast agent may improve results but should be adapted according to the experience of the sonologist. Direct instillation of water or a non-absorbable solution e.g. polyethelene glycol (PEG) by a nasojejunal or rectal probe can be used before the procedure.

Hydrosonography requires anti-peristaltic agent like Hyosine N-butyl bromide. In the previous study of Rabbi et al. and Osman, et. al., they used IV route of the agent to achieve optimal distention of the stomach and suppress gastric peristalsis. Water that was used ranges 250 – 700 ml and 700 -1000 ml, respectively. The result of the study of Rabbi et al. in detecting gastric carcinoma using this method shows the values of sensitivity, specificity and accuracy corresponds to 81.82 %, 96.43 % and 90 %, respectively.

Erect scanning of the pancreas using gastric window, or by semi-erect, oblique and decubitus window provided significantly improved visualization of the pancreas in 93 % of the subjects according to Macmamon and colleagues. Further stated that fluid moves the air from gastric antrum to the fundus where it does not overlie the pancreas. As the upper abdominal viscera move downward, the liver and the distended large abdominal vein provide acoustic window.

pH of a solution is the negative common logarithm of the hydrogen ion activity: \( pH = -\log (H^+) \). In pure water, a decrease of pH for about 0.45 occurs as temperature is raised by 25-degree Celsius.
The pH of usual raw water lies within 6.5-8.5. The optimum pH range from 6.5 to 9.5 depending on the composition of the water and the construction materials used in the distribution of the water. (10)

Common commercially available water shows that distilled water has pH ranges from 4.0 – 6.5(23). Water with pH less than 6.5 is considered acidic while basic or alkaline if with pH higher than 8.5. (24)

Under normal condition, dinking large amount of hypotonic fluid such as water will usually reach the urinary bladder after 15 minutes and will peak at 40 minutes. (7) About 1100 ml of blood is being filtered by the kidney each minute. (6)

OBJECTIVES

A. General Objective
The main purpose of this study is to find out if there will be a significant gallbladder volume changes after oral intake of alkaline water compared to GB of subjects on NPO. Significant change means a decrease in the gallbladder volume by > 20 % from the baseline volume.

B. Specific Objectives
1. To obtain baseline gallbladder volume among control group (no water intake) and treatment group (to drink up to 500 ml alkaline water with pH 9.0 at room temperature).
2. To obtain the gallbladder volume changes after 5 minutes, 30 minutes and 60 minutes after initial scan among the two groups.
3. To provide a descriptive analysis of demographic profile of the subjects which include the age, weight, height, Body Mass Index (BMI) and heart rate, and the GB ultrasound findings.

MATERIALS AND METHODOLOGY

Sample Size and Subject Selection
Sixty (60) subjects with age 18-65 years old from Davao City on NPO for at least six hours were randomly assigned in two groups, the control and the treatment groups, each with 30 subjects.

Inclusion Criteria
Individual from all gender with ages 18 - 65 years with no history of gallbladder surgery.

Exclusion Criteria
Those who cannot tolerate NPO for at least six hours, symptomatic individuals with known cardiac, renal and hepatic failure, and volunteers with sonographic GB findings of cholelithiasis or polyps obscuring more than 50% of the GB lumen or with sonographic findings of acute cholecystitis.

Materials
Nature’s Spring ® Mineral Water, 500 ml, labeled pH 9.0 was utilized in this study. Random pH testing using color indicator strip showed pH between 8.0 and 9.0. Random water temperature was at 25.5 °C.

All three ultrasound machines have a brand of General Electric (GE) with models Logic S8 and Logic E9 and utilized curved transducer of 5 megahertz (MHz) frequency.

Time Frame and Study Setting
This study has been reviewed and approved by the Ethics Review Board of Davao Doctors Hospital (DDH) and Philippine College of Radiology. Study period started from January 7 to March 8, 2015 with modification on April 24, 2015 to May 29, 2015. Experiment was conducted in the Radiology Ultrasound Section of DDH.

Study Maneuver
Randomization using coin tossing assigned subjects with odd number as the control group, while the even number as the treatment group.
Consent was secured using English and Filipino languages (Tagalog and Bisaya) according to subject’s preference. Data including the age, sex, weight, height and heart rate were obtained.
All subjects were scanned in the morning with heart rates taken at rest. Subject in supine position, transducer was placed in the right subcostal or intercostal areas. Fifty-six of the subjects have their GB volumes obtained in supine position while four needed to be in the left lateral decubitus position with transducer positioned in the subcostal space. Baseline GB volume were obtained similar to the ellipsoid method. Control subject’s GB volumes were obtained for three times and averaged as baseline, after 5 minutes, 30 minutes and 60 minutes. The same method was used in treatment group except that after the baseline measurement, they were given drinking water to be consumed for 2 to 5 minutes. Twenty-eight of the subjects in group tolerated 500 ml while two tolerated up to an approximate volume of 400 ml. A thorough scan of the GB to evaluate for the presence of abnormalities was also done.

Study Design
This is a prospective randomized design.
Treatment of Data

Mean volume changes in each period of time were obtained from the two groups. Volume changes were measured and correlated using Paired T-Test through Statistical Package for the Social Sciences (SPSS) Version 16. Levene’s test was used to determine the degree of variation of the mean volumes between the two groups. Demographic profile of the subjects and ultrasound GB findings were tabulated according frequency and percentage distribution.

Diagram 1. The Summary of the methodology

Definition of Terms
1. BMI or Body Mass Index, is a measure of relative size based on the mass and height in (kg/m²). (25)
2. Cholecystitis in acute condition manifests right upper outer quadrant tenderness with GB wall edema and usually associated with gallstone. (26)
3. Cholecystitis in chronic condition is usually associated with calculus with ultrasound findings of wall thickening, absence of sonographic Murphy’s sign and hyperemia of the wall. (26) (Fig. 1d).
4. Cholelithiasis ultrasound appearance is echogenic and mobile focus within the GB and show acoustic shadowing is a calcium based calculus. (26) (Fig. 1d).
5. GB polyp ultrasound appearance is ovoid non shadowing lesions attached to GB wall. (26) (Fig. 1b).
6. GB sludge has ultrasound findings of layering echogenic focus which can be due to bile stasis due to cholesterol or microlithiasis. (26) (Fig. 1c).

RESULTS AND DISCUSSION

The table below shows the summary of the demographic profile of the subjects and sonographic GB findings.

Table 1. Demographic profile of the subjects

<table>
<thead>
<tr>
<th>Mean age: 40.32 ± 12.8 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 males and 40 females</td>
</tr>
<tr>
<td>Predominant population GB characteristics</td>
</tr>
<tr>
<td>Normal BMI (46.67%)</td>
</tr>
<tr>
<td>Normal heart rate (76.67%)</td>
</tr>
<tr>
<td>Normal sonographic GB (70 %) (Fig.1a)</td>
</tr>
<tr>
<td>Other sonographic findings: polyps (Fig.1b), GB sludge (Fig 1c), Chronic cholecystitis with cholelithiases (Fig. 1d)</td>
</tr>
</tbody>
</table>

The result showed that both the control and treatment group has increased the average GB volumes in all periods (Table 2 and Figure 2), and all are statistically significant (Table 3). The variation of changes between the two groups using Levene’s test are statistically insignificant (Table 4). It was greatest at the interval of 60 minutes by 16.51 % in the treatment group who drank alkaline water (Figure 2). It supports the theory of feedback mechanism. As the duodenum becomes less acidic, secretion of the bile is inhibited via the vagus influence and hormone secretin, hence facilitate storage of bile to the gallbladder and increased its volume. GB dynamics in response to water intake is being scientifically experimented here to prove the hypothesis that it does not significantly affect the organ in the physiologic basis, because water does not contain fat, protein nor other nutrients that may stimulate release of gastric acid. Distilled water which is most likely near neutral yet acidic was avoided because of this theory. Hence, justifies the use of alkaline water because GB is better evaluated when distended.

Table 2. Control group vs treatment group mean baseline and interval time volume changes

<table>
<thead>
<tr>
<th>Group</th>
<th>Time period</th>
<th>Ave. vol (ml)(N=30)</th>
<th>↑ Vol. (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>Baseline</td>
<td>20.6608</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-min</td>
<td>21.7662</td>
<td>1.1054</td>
</tr>
<tr>
<td></td>
<td>30-min</td>
<td>22.7042</td>
<td>2.0434</td>
</tr>
<tr>
<td></td>
<td>60-min</td>
<td>22.1760</td>
<td>1.5152</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>Baseline</td>
<td>20.8293</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-min</td>
<td>21.2600</td>
<td>0.4307</td>
</tr>
<tr>
<td></td>
<td>30-min</td>
<td>21.8738</td>
<td>1.0445</td>
</tr>
<tr>
<td></td>
<td>60-min</td>
<td>24.2667</td>
<td>3.4374</td>
</tr>
</tbody>
</table>
Table 3. Statistical significance using T-test

<table>
<thead>
<tr>
<th>Pair (Mean)</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>Sig (2-tailed)</td>
</tr>
<tr>
<td>Baseline-5 min</td>
<td>-3.057</td>
<td>.005</td>
</tr>
<tr>
<td>Baseline-30 min</td>
<td>-3.040</td>
<td>.005</td>
</tr>
<tr>
<td>Baseline-60 min</td>
<td>-2.283</td>
<td>.030</td>
</tr>
</tbody>
</table>

*p-value < .05 is statistically significant

Table 4. Levene’s test showing variation of volume changes between the control and the treatment groups

<table>
<thead>
<tr>
<th>Baseline equal variances assumed and not assumed</th>
<th>Equality of variances</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig</td>
</tr>
<tr>
<td>60 min</td>
<td>13.058</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>-1.250</td>
<td>-1.250</td>
</tr>
<tr>
<td>30 min</td>
<td>1.781</td>
<td>.187</td>
</tr>
<tr>
<td></td>
<td>.829</td>
<td>.829</td>
</tr>
<tr>
<td>5 min</td>
<td>9.294</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>.637</td>
<td>.637</td>
</tr>
</tbody>
</table>

 Figure 2. Percentage of GB volume increase from the baseline

The author thinks that extreme temperatures and rapid gastric stretch may influence to GB contractility via parasympathetic influence, thus avoided by storing the water at room temperature and by slow ingestion of water (2-5 minutes).

In the demographic profile of the subjects, 14 asymptomatic subjects with no signs of cardiac failure demonstrate bradycardia ranging from 44-58 beats per minute (bpm). This range of heart rate can be normal to a resting athletic individual or in low metabolic state, i.e. after sleep and fasting. Two anxious asymptomatic subjects have tachycardia of 108 and 110 bpm.

With a significant number of requests for abdominal ultrasound in patients complaining of abdominal pain, routine procedure is not usually helpful in the evaluation of the stomach and duodenum, which can be the involved organs. The main reason is the non-visualization of these organs when empty. As previously mentioned, hydrosoundography is advocated, but it is a special procedure and requires IV administration of anti-peristaltic agent to maximize the gastric distention by retaining the water. Efficiency and cost-effectiveness of a certain diagnostic modality is important. This method can be used as a modified hydrosoundography by means of drinking alkaline water within 60 minutes before the procedure.

In case of patient having no upper abdominal symptoms, drinking of water has the benefits of better evaluation of the pancreas, filling the urinary bladder to better visualize the pelvic organs, and to relieve patient’s thirst.

CONCLUSION

Oral intake of alkaline water amounting 400-500 ml at room temperature shows no significant decrease of GB volume. GB volume increases whether on NPO or with alkaline water intake. Hence the use of alkaline water in a modified hydrosoundography is not a contraindication for GB evaluation, and is found to be beneficial.

RECOMMENDATION

Extending the time interval for more than 60 minutes in observing the GB volume changes after alkaline water intake may further establish the length of time to which the procedure is beneficial. Test for other type of water is also encouraged.

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PROGNOSTIC VALUE OF ULTRASOUND IN THE POST-OPERATIVE SITE AFTER MASTECTOMY IN ST. LUKE’S MEDICAL CENTER: A THREE YEAR REVIEW (2012 - 2014)

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*Institute of Radiology, St. Luke’s Medical Center, Quezon City.
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ABSTRACT

Objectives: The aim of the research is to determine the prognostic value of ultrasound in the post-operative sites among patients who underwent mastectomy with and without adjuvant therapy. The authors determine and analyze the rate of local recurrence, the risk factors of these patients and their correlation with the disease, the common sonographic findings of local chest wall recurrence, the correlation between the incidence of the recurrence and the stage, grade and histopathology of the tumor and the association of time elapsed after surgical management and recurrence.

Methods: This is a retrospective study of all ultrasound examinations of female patients who underwent mastectomy with and without adjuvant treatment from January 2012 to December 2014 in a tertiary hospital. The results of ultrasound were analyzed using an equivalent three-point grading system: Grade 1 as those with no discrete lesion, Grade 2 as probable benign findings, and Grade 3 as probable local recurrence. The results were compared with histologic findings or the results of follow-up examinations for at least six months. Characterization of the ultrasound findings of local recurrence was noted. Furthermore, correlation between the time after surgical treatment with local recurrence was investigated.

Results: From a total of 508 post-mastectomy patients for the period of 2012 to 2014, half did not have ultrasound or mammogram follow-up diagnostic examination. A total of 229 patients had a follow-up ultrasound and/or mammography, and they are the ones included in the study to determine the prognostic value of ultrasound in the post-operative site. Of the total number of patients who had ultrasound follow-up, 72.5% underwent mammogram also. Majority (81%) of the follow-up was done within 12 months. About the same number of patients (81.2%) had one to three follow-ups done within 12 months. Majority (83.8%) of the follow-up findings yield no discrete lesion, but 11.4% were probable benign findings, and 4.8% were probable local recurrences. The most common ultrasound finding in the mastectomy site for those patients with probable benign lesions is a solid nodule, followed by a simple cyst. On the other hand, the most common ultrasound finding in the mastectomy site for those probable local recurrences patients is a hypoechoic solid nodule. Our results show that ultrasound has a sensitivity of 100%, specificity of 98%, accuracy of 98%, positive predictive value (PPV) of 55%, and negative predictive value (NPV) of 100% for the detection of local recurrence. Most of the recurrences present as hypoechoic lesions. Suspicious findings for local recurrence was seen as early as three months but with most occurring after 20 months. Characterization of local recurrence was observed as early as three months. However, most recurrences were observed in six to 12 months (three patients with recurrences). The year diagnosed, age group, marital status, histopathological findings, and grade were not significant factors for cancer recurrence. On the other hand, tumor size and stage are significantly related with recurrence. It can be noticed that the bigger the tumor size is, the higher the possibility of recurrence is, and that the higher the stage, the higher chance of recurrence.

Conclusions and Recommendation: Ultrasound is a highly sensitive and specific examination in determining local chest wall recurrences. Ultrasound characteristics during evaluation of local recurrence in the chest wall after mastectomy lead to the eventual management of the patient, with probable benign lesions for close follow up, and probable local recurrences for histopathologic correlation. The rate of recurrence in the chest wall after mastectomy is relatively low in the study institution. Tumor size and stage are significantly related with recurrence, with a larger tumor size and a more advanced stage associated with a higher possibility of recurrence. Histopathologic findings and tumor grade were deemed not significant factors for local cancer recurrence in this study. Most tumor recurrences presented as hypoechoic lesions. Local recurrence was observed as early as three months with most recurrences occurring in six to 12 months. The recommendation is to start surveillance as early as three months if with high probability for local recurrence, or after six months for two years, and then annually thereafter.
INTRODUCTION

Breast cancer treated with modified radical mastectomy and axillary lymph node dissection still has a recurrence risk of as high as about 20-40% (Asrif et al, 2011). This is particularly true if no adjuvant treatment was done such as post-surgical radiotherapy or chemotherapy, both of which are noted to result in significant reduction of loco-regional failure (Taghian et al, 2004). In our institution, radiologists recommend post-operative ultrasound and mammogram done as follow up to help in the early detection of recurrence. Findings of suspicious lesions in the post mastectomy site may be a source of diagnostic dilemma. Not all clinicians follow this recommendation. Some patients undergo mammogram of the remaining breast without ultrasound. In our institution, no study has yet been done regarding the value ultrasound examination in the post-mastectomy site, as well as the incidence of local recurrence among our patients and its radiologic characteristics and thus, it had been the interest of the authors to conduct one. The purpose of this study was to know the prognostic value of ultrasound in the post-mastectomy site.

Rissanen et al (1993) stated that the sensitivity of ultrasound was 91%, comparably better than the sensitivities recorded for clinical examination and mammography (79% and 45%, respectively). According to them, ultrasound was the best imaging method for evaluating tumors in the chest wall far from the scar and in the axillary regions. This is due to the fact that mammograms cannot optimally visualize these areas. This is supported by the study done by Kim et al (2004), which went further and concluded that evaluation of a mastectomy site is more effective with ultrasonography than with mammography or even with chest computed tomography. The usual local recurrence noted are small and close to the skin surface, making ultrasound the better choice in its evaluation. Kim et al also pointed out the advantages of ultrasound stating that it has multiplanar scanning capability, no ionizing radiation, readily available and cost-effective, and can be used as a guide in biopsy procedures of suspicious lesions. In a more recent study by Usmani et al (2010), ultrasound has a sensitivity of 86%, specificity of 77%, accuracy of 83%, PPV of 89% and NPV of 71% in detecting local recurrence.

After mastectomy, breast cancer recurs locally in 5–10% of patients, depending on the initial stage and grade of the tumor and the treatment administered (Usmani, 2010). Higher rates of loco-regional recurrence have been demonstrated in patients who present with clinical stage of equal or greater than III, even if they achieve a pathologic complete response after neoadjuvant chemotherapy (White et al, 2014). According to Multak et al (2012), a primary tumor bigger than two cm in size carries a higher risk of recurrence. They also concluded that the stage has a directly proportional relationship with the chance of recurrence.

METHODOLOGY

This is a retrospective study of all female patients who underwent mastectomy with and without adjuvant treatment from January 2012 to December 2014 at a tertiary hospital. All of these patients have undergone ultrasound examination after mastectomy.

Ultrasound of the chest wall or mastectomy site was done according to the American College of Radiology guidelines (2011, amended 2014). Technical considerations are as follows: 1) A linear array transducer of 10 MHz was used; 2) The focal zone was set at the depth of the chest wall, or at depth of lesions identified; 3) Gain settings were adjusted accordingly to distinguish cysts from solid, and fat to be medium or light grey; and 4) Breast lesions identified should be viewed from two perpendicular projections (sagittal and transverse views). The patient was placed in a supine position, with arms elevated, and hands clasped behind the neck in order to thin out the breast parenchyma and improve the angles. Sagittal, transverse, radial and tangential scans were done to cover the entire chest wall or mastectomy site. The breast side is labeled as either right or left. Quadrants were used to identify the position of the lesion (upper inner, upper outer, lower inner and lower outer). Images of each quadrant were recorded, and pertinent findings saved with and without calipers.

The results of ultrasound were analyzed using an equivalent three-point grading system: Grade 1 as those with no discrete lesion, Grade 2 as probable benign findings, and Grade 3 as probable local recurrences. The results were compared with histologic findings or the results of follow-up examinations for at least 6 months.

Characterization of the ultrasound findings of local recurrence was done. Furthermore, correlation between the time after surgical treatment with local recurrence was investigated.

Statistical correlation using univariate analysis between recurrence rate and certain associated variables namely age, marital status, latency period between surgical management and recurrence in months, size, histopathology of the primary tumor, and tumor grade and stage was done among patients with and without adjuvant treatment.
RESULTS

From a total of 508 post-mastectomy patients for the period of 2012 to 2014, half did not have ultrasound or mammogram follow-up diagnostic examination. A total of 229 patients had follow-up with ultrasound only or with combined ultrasound and mammography, and they are the ones included in the study to determine the prognostic value of ultrasound in the post-operative site (Table 1).

The age of these 229 female patients ranged from 30 to 90 years old, with average age of 52 years old (SD of 11.048) was presented in Table 2.

Most patients are from 2013 records, constituting about 43% of the total samples. One-third of them came from 40 to 49 years old age group, while senior citizens (age 60 and above) represent 26.6% of the total samples. Evidently, most patients were married (66.4%). Histopathologic findings show that most examined cells are ductal in nature, representing 90% of all examined. Majority of the cases examined have poor histopathologic grade (82.1%), have tumor size of 2-5 cm (57.2%), and are in Stage 2 (45.9%). (See Table 3).

Of the total number of patients who had ultrasound follow-up, 72.5% also underwent mammogram. Majority (81%) of the follow-up was done within 12 months. About the same number of patients (81.2%) had one to three follow-ups done within 12 months. Majority (83.8%) of the follow-up findings yield no discrete lesion but 11.4% were probable benign findings, and 4.8% were probable local recurrences. (Refer to Table 4).

The most common ultrasound finding for those patients with probable benign lesions is a solid nodule, followed by simple cyst and hypoechoic nodule as shown in Figures 1 and 2.

<table>
<thead>
<tr>
<th>Imaging Follow-Up vs. Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Follow-Up</td>
<td>48</td>
<td>93</td>
<td>113</td>
<td>254</td>
</tr>
<tr>
<td>Mammogram only</td>
<td>8</td>
<td>13</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Ultrasound only</td>
<td>13</td>
<td>25</td>
<td>25</td>
<td>63</td>
</tr>
<tr>
<td>Ultrasound &amp; Mammogram</td>
<td>53</td>
<td>73</td>
<td>40</td>
<td>166</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>204</td>
<td>182</td>
<td>508</td>
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</table>

<table>
<thead>
<tr>
<th>Age of Patient</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error of Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
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</thead>
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<tr>
<td>Age of Patient</td>
<td>229</td>
<td>52.46</td>
<td>0.730</td>
<td>11.048</td>
<td>30</td>
<td>90</td>
</tr>
</tbody>
</table>

Figure 1. A solid nodule is noted at the lower outer quadrant of the mastectomy site. This was signed out as a probably benign lesion (BI-RADS 3). Follow up in six months was recommended.

Figure 2. A cystic lesion structure is seen at the mid area of the mastectomy site, and was signed out as a benign lesion (BI-RADS 2).
Table 3. Frequency Distribution – Demographic & Histopathologic Profile.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year Diagnosed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>66</td>
<td>28.8</td>
</tr>
<tr>
<td>2013</td>
<td>98</td>
<td>42.8</td>
</tr>
<tr>
<td>2014</td>
<td>65</td>
<td>28.4</td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 to 39 y.o.</td>
<td>25</td>
<td>10.9</td>
</tr>
<tr>
<td>40 to 49 y.o.</td>
<td>77</td>
<td>33.6</td>
</tr>
<tr>
<td>50 to 59 y.o.</td>
<td>66</td>
<td>28.4</td>
</tr>
<tr>
<td>60 y.o. &amp; up</td>
<td>61</td>
<td>26.6</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Married</td>
<td>77</td>
<td>33.6</td>
</tr>
<tr>
<td><strong>Histopathologic Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colloid</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Ductal</td>
<td>205</td>
<td>89.5</td>
</tr>
<tr>
<td>Lobular</td>
<td>9</td>
<td>3.9</td>
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<tr>
<td>Metaplastic CA</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Mucinous</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Papillary</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Phylloides</td>
<td>5</td>
<td>2.2</td>
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<tr>
<td><strong>Histopathologic Grade</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well-differentiated</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>33</td>
<td>14.4</td>
</tr>
<tr>
<td>Poor</td>
<td>188</td>
<td>62.1</td>
</tr>
<tr>
<td><strong>Tumor Size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 cm</td>
<td>64</td>
<td>27.9</td>
</tr>
<tr>
<td>2 – 5 cm</td>
<td>131</td>
<td>57.2</td>
</tr>
<tr>
<td>&gt;5 cm</td>
<td>34</td>
<td>14.8</td>
</tr>
<tr>
<td><strong>Stage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>21</td>
<td>9.2</td>
</tr>
<tr>
<td>1</td>
<td>48</td>
<td>21.0</td>
</tr>
<tr>
<td>2</td>
<td>105</td>
<td>45.9</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
<td>20.5</td>
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<tr>
<td>4</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4. Frequency Distribution – Ultrasound Follow-Up.

<table>
<thead>
<tr>
<th>Type of Follow-Up Procedure</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound only</td>
<td>63</td>
<td>27.5</td>
</tr>
<tr>
<td>Ultrasound and Mammogram</td>
<td>166</td>
<td>72.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Interval of Ultrasound follow-up</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8months</td>
<td>65</td>
<td>28.4</td>
</tr>
<tr>
<td>6-12months</td>
<td>120</td>
<td>52.4</td>
</tr>
<tr>
<td>13-18months</td>
<td>3.5</td>
<td>15.3</td>
</tr>
<tr>
<td>19-24months</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>&gt;24months</td>
<td>1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Follow-Ups Done</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>77</td>
<td>33.6</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>30.6</td>
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<tr>
<td>3</td>
<td>39</td>
<td>17.0</td>
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<tr>
<td>4</td>
<td>24</td>
<td>10.5</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>6.6</td>
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<tr>
<td>6</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ultrasound Findings in Post-Mastectomy Site</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Discrete Lesion</td>
<td>192</td>
<td>83.8</td>
</tr>
<tr>
<td>Probable Benign Lesions</td>
<td>26</td>
<td>11.4</td>
</tr>
<tr>
<td>Probable Local Recurrence</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 5. Probable Benign Ultrasound Findings in the Post-Mastectomy Site

<table>
<thead>
<tr>
<th>Imaging Follow-Up vs. Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated Cyst</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Simple Cyst</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Fluid Collection/Seroma</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Hypoechoic nodule</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Solid Nodule</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>26</td>
</tr>
</tbody>
</table>
On the other hand, the most common ultrasound finding for those with probable local recurrence is a hypoechoic solid nodule as seen in Table 5.

**Correlation Analysis – Recurrence**

Biopsy was done on the 11 patients with imaging findings of probable local recurrence by ultrasound. Histopathologic correlation revealed six of 11 were proven to be cancer. Local recurrence was observed as early as three months. However, most recurrences were observed in six to 12 months (three patients with recurrences). (Tables 6 to 8).

Our results show that ultrasound has a sensitivity of 100%, specificity of 98%, accuracy of 98%, PPV of 55% and NPV of 100% for the detection of local recurrence.

To determine factors that might affect recurrence of cancer, Chi-Square Test of Independence was used at 5% level of significance. As shown in the table below, year diagnosed, age group, marital status, histopathologic findings, and grade were not significant factors for cancer recurrence. On the other hand, tumor size and stage are directly correlated to possibility of recurrence. (Table 9).

---

### Table 6. Ultrasound Findings of Probable Local Recurrence

<table>
<thead>
<tr>
<th>Imaging Follow-Up vs. Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoechoic solid nodule</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Ill-defined Solid nodule</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Large Mass</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

### Table 7. Time in Months of Suspicious Findings for Local Recurrence

<table>
<thead>
<tr>
<th>Recur Time in Months vs. Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 3 months</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4 to 7 months</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8 to 11 months</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>12 to 15 months</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>16 to 19 months</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>20 months &amp; up</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

### Table 8. Crosstabulation – Follow-Up Turn Out

<table>
<thead>
<tr>
<th>Imaging Follow-Up vs. Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of Follow-Up Done</td>
<td>66</td>
<td>98</td>
<td>65</td>
<td>229</td>
</tr>
<tr>
<td>Total No. of Probable Local Recurrences</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Total No. of Proven Benign Lesions</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total No. of Proven Local Recurrence</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Ultrasound Findings of Proven Local Recurrence

1. Hypoechoic solid nodule
2. Hypoechoic Nodule
1. Hypoechoic solid nodule
2. Hypoechoic Nodule
Table 9. Chi-Square Analysis - Recurrence

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No Recurrence</th>
<th>With recurrence</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year Diagnosed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>64</td>
<td>2</td>
<td>0.226</td>
</tr>
<tr>
<td>2013</td>
<td>96</td>
<td>2</td>
<td>0.893(^{ns})</td>
</tr>
<tr>
<td>2014</td>
<td>63</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 to 39 years old</td>
<td>24</td>
<td>1</td>
<td>0.861</td>
</tr>
<tr>
<td>40 to 49 years old</td>
<td>76</td>
<td>1</td>
<td>0.835(^{ns})</td>
</tr>
<tr>
<td>50 to 59 years old</td>
<td>64</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>60 years old &amp; up</td>
<td>59</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not-Married</td>
<td>77</td>
<td>0</td>
<td>3.121</td>
</tr>
<tr>
<td>Married</td>
<td>146</td>
<td>6</td>
<td>0.077(^{ns})</td>
</tr>
<tr>
<td><strong>Histopathologic Type</strong></td>
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</tr>
<tr>
<td>Ductal</td>
<td>199</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Others (Not Ductal)</td>
<td>24</td>
<td>0</td>
<td>0.721</td>
</tr>
<tr>
<td>Colloid</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Lobular</td>
<td>9</td>
<td>0</td>
<td>0.396(^{ns})</td>
</tr>
<tr>
<td>Metaplastic CA</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mucinous</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Papilllary</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Phyllloides</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Histopathologic Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well-differentated</td>
<td>8</td>
<td>0</td>
<td>1.344</td>
</tr>
<tr>
<td>Moderate</td>
<td>33</td>
<td>0</td>
<td>0.511(^{ns})</td>
</tr>
<tr>
<td>Poor</td>
<td>182</td>
<td>6</td>
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</tr>
<tr>
<td><strong>Tumor Size</strong></td>
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<td></td>
</tr>
<tr>
<td>&lt;2cm</td>
<td>64</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2-5cm</td>
<td>129</td>
<td>2</td>
<td>13.479</td>
</tr>
<tr>
<td>&gt;5cm</td>
<td>30</td>
<td>4</td>
<td>0.001**</td>
</tr>
<tr>
<td><strong>Stage</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>21</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>48</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>105</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>6</td>
<td>23.859</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>0</td>
<td>0.000**</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>223</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

\(\text{ns} - \text{not significant}\)

* - significant at 5% level of significance

** - significant even at 1% level of significance
DISCUSSION

The post-operative breast presents with various post-treatment findings. These include fluid collection, architectural distortion, scarring, edema, skin thickening and calcification (Temple, 1999). Physical examination alone is not as reliable in determining presence of local recurrences. Ultrasonography is a useful diagnostic examination especially in determining small lesions close to the skin surface, (Usmani, 2014).

In this study, a total of 229 patients who underwent mastectomy operations for the period of 2012 to 2014 and had follow-up ultrasound with or without mammogram examination were included in the study to determine the prognostic value of ultrasound in the post-operative site.

Our results shows that ultrasound has a sensitivity of 100%, specificity of 98%, accuracy of 98%, PPV of 55% and NPV of 100% for the detection of local recurrence. This is high when compared to the study done by Usmani et al (2014), wherein it was determined that ultrasound has a sensitivity of 86%, specificity of 77%, accuracy of 83%, PPV of 89% and NPV of 71% for the detection of local recurrence. These values are important because it points out the significance of ultrasound as a diagnostic examination. In comparison to clinical examination and mammography, it is deemed more sensitive, as noted by Rissanen et al (1993), with clinical examination having a sensitivity of 79%, whereas that of mammography with 45%. Cancer recurrence are usually seen as hypoechoic lesions (Usmani et al, 2014). As was noted in our study, most of the tumor recurrences in our study presented as hypoechoic lesions (Figure 3). One of the recurrences presented as a large mass.

Mastectomy is usually performed when the entire cancer cannot be removed with good cosmetic outcome, if there is contraindication to radiotherapy, or if the patient opted for it (Ikeda et al, 2011). A study by Azrif et al in 2011 determined that locoregional recurrences are seen at a rate of 20 to 40%, occurring 1-2% per year (Kattlove, 2003). It is usually dependent on the initial stage and grade of tumor, and is indicative of a worse prognosis that the initial presentation. The most common site of recurrence is the chest wall, and is often noted with distant metastases. Thus, a finding of such possible recurrence should lead to further investigation. In our study, age group, marital status, histopathology findings, and grade were not significant factors for cancer recurrence. On the other hand, tumor size and stage are significantly related with recurrence. Increased tumor size is associated with a higher possibility of recurrence. According to Multak et al (2012), a primary tumor bigger than two cm in size carries a higher risk of recurrence. The same is true for stage – the higher the stage, the higher chance of recurrence.

Figure 3. The mastectomy site shows an irregular hypoechoic mass at the upper outer quadrant associated with skin thickening. This was categorized as a suspicious abnormality (BI-RADS 4). Biopsy confirmed cancer recurrence.
Of the total number of patients who had ultrasound follow-up, 72.5% also underwent mammogram. Majority (81%) of the follow-up was done within 12 months. About the same number of patients (81.2%) had 1 to 3 follow-ups done. Majority (83.8%) of the follow-up findings yield no discrete lesion, but 11.4% were probable benign, and 4.8% were probable cancer. The rate of cancer recurrence is only 3%, which is very low. In comparison with other studies, the rate is as high as 20-40% (Azrif et al) or as low as 9.8% (Jonas lundkvist et al, 2005). Suspicious findings for local recurrence was seen as early as three months but with most occurring after 20 months. Local recurrence was observed as early as three months. However, most recurrences were observed in six to 12 months (three patients with recurrences). This is not in keeping with the other studies done by Multak et al (2012) and Morihiko Kimura et al (2007) in which most of the recurrences occurred between 12-19 months. This concept is important in determining the prognosis of the patient, as an early recurrence is associated with a significantly worse survival (Mutlak, 2012), likely relating to the more aggressive nature of the disease.

CONCLUSION

Ultrasound is a highly sensitive and specific examination in determining local chest wall recurrences. Ultrasound characteristics during evaluation of local recurrence at the chest wall after mastectomy lead to the eventual management of the patient, with probable benign lesions for close follow up, and probable cancer lesions for histopathologic correlation. The rate of recurrence in the chest wall after mastectomy is relatively low in our institution. Tumor size and stage are significantly related with recurrence, with a larger tumor size and a more advanced stage associated with a higher possibility of recurrence. Histopathologic findings and tumor grade were deemed not significant factors for local cancer recurrence in this study. Most tumor recurrences presented as hypoechoic lesions. Local recurrence was observed as early as three months with most recurrences were observed in six to 12 months. Our recommendation is to start surveillance as early as three months if with high probability for local recurrence, or after six months for two years, and then annually thereafter.

REFERENCES

RADIOGRAPHIC FINDINGS OF MULTIDRUG-RESISTANT PULMONARY TUBERCULOSIS IN FACILITIES WITH PROGRAMMATIC MANAGEMENT OF DRUG-RESISTANT TUBERCULOSIS (PMDT): A CROSS-SECTIONAL STUDY

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Department of Radiological and Imaging Sciences
Southern Philippines Medical Center,
Davao City

ABSTRACT

Objective: The research is a cross-sectional study that aims to describe the radiological findings of multidrug-resistant TB (MDRTB) using conventional radiographs and high-resolution CT (HRCT) in non-AIDS patients, and to determine if there are sociodemographic patterns to the disease managed by the PMDT facilities of two Davao Region tertiary hospitals.

Methods: Forty-one (41) patients enrolled in the two tertiary hospital PMDTs were included and had chest radiographs (postero-anterior, lateral and apicolordotic views) and plain HRCT scan at their respective hospitals. The images were read by three independent radiologists, with lesions characterized and tallied per lung field in conventional x-rays and per lung lobe in CT scans. The resulting data were analyzed using descriptive statistics, paired T-test and Pearson correlation. The patients’ demographic data were also reviewed.

Results: In the radiographs, the most common lesions noted were reticular infiltrates (39%), pleural thickening (13.8%), cavities (9.2%), reticulonodular infiltrates (8.3%), and bronchiectasis (7.8%). In CT, the 5 most frequent lesions are pleural thickening (14.03%), tree-in-bud lesions (13.37%) small nodules (11.55%), bronchiectasis (10.89%), and cavities (9.41%). In X-ray, 27% of the lesions are seen in the right upper lung field, followed by the left upper lung field (22%) and the left middle lung field (14%). In CT, 27% are seen in the right upper lobe, followed by the left upper lobe (17.99%), the right lower lobe (17.66%), left lower lobe (14.03%), the left middle lobe/lingula (11.88%) and the right middle lobe (11.39%). There is no significant statistical difference in the severity of extent of lesions between lung fields but with highly significant differences between lobes (p=0.009). Seventy five per cent (75%) of the volunteers are male. Mean age is 41.5±12.29 years with majority belonging to the lowest income bracket and are unemployed. They lived in areas with mean population densities of 2218.57±3918.0 persons per km². All had a history of cough and a completed previous treatment. Most common co-morbidity was diabetes mellitus (42.5%). Mean duration since start of treatment was 169±180 days with 62.5% of them within 142 days of treatment. Smoking history was noted in 35%.

Conclusion: MDRTB is characterised by pleural thickening, bronchiectasis, nodules, cavities, and tree-in-bud lesions. The right upper lobe has significantly the most number of lesions. HRCT is recommended for cases of PTB with completed but failed treatments, with cavities and centrilobular nodules as strong indicators. Clinical and sociodemographic findings show that MDRTB is more prevalent in the lowest income class and the densely populated areas.

INTRODUCTION

Multidrug-resistant TB is a life-threatening disease that is contagious and may undermine the current TB treatment programs. It is defined as TB that is resistant to at least rifampicin and isoniazid. Despite its gravity, it has no clinical difference from drug-sensitive strains. It is more difficult and more expensive to treat, and has lower success rates. The need for better diagnostic methods is present but current diagnosis is still mainly by a high index of suspicion and sputum smears. Routine culture and sensitivity studies may take 3-4 weeks, allowing an infected person to expose more individuals before appropriate treatment is started. Radiographic studies may allow for faster diagnosis and prompt treatment of the disease.
OBJECTIVES

General Objective
This study will serve as a baseline study in profiling the sociodemographic, clinical and radiologic characteristics of non-HIV-infected MDRTB patients seen and managed by PMDTs of two Davao Region tertiary hospitals. Studies have proposed that HIV-infected patients may present with different imaging features and are therefore to be excluded.2,4

Specific Objectives
Specifically, the study determined the following:

a. Radiographic profile: The extent of lesions per lung zone in posteroanterior, lateral and apicolordotic chest radiographs; per lobe in CT
b. Clinical profile: Episodes of hemoptysis, fever, significant weight loss, previous treatment and presence of co-morbidities such as diabetes mellitus or malignancy.
c. Sociodemographic profile: age, sex, annual income, place of residence, and population density of the place of residence (based on latest the 2010 National Statistics Office survey11)

METHODOLOGY

A. Study Design
The study is cross-sectional in design.

B. Study Population
1. Inclusion criteria
Patients under the PMDT who were positive for Rifampicin resistance by the screening test GeneXpert and/or confirmed by drug-susceptibility testing (DST)5. None of the patients were established to have HIV. Patients were included regardless of their treatment status, as the study is cross-sectional by design. Treatment was not withheld on account of the study.

2. Exclusion criteria: Patients who are pregnant patients, could not tolerate the positions required to optimally perform the procedures or those with unstable vital signs would be excluded, but none of the volunteers fit the exclusion criteria.

C. Definition of Terms (see Appendix).

D. Sampling Procedures
The Principal Investigator (PI) coordinated with the two Davao Region tertiary hospitals PMDTs to schedule each patient for the procedures. Each patient was interviewed and his records were reviewed.

E. Procedure for Acquisition of Images
Chest radiographs. Posteroanterior, apicolordotic and left lateral views of the chest were taken at a distance of six (6) feet from source to detector, 120kVp and 200-250mA.

Computed tomography. Multiple plain axial images of the chest were acquired using a 16-slice helical CT scanner (Hitachi Eclos in Tertiary Hospital 1 (TH1) and Siemens SOMATOM Sensation in Tertiary Hospital 2 (TH2)). Images were acquired with 0.625mm collimation, 120kVp, 200mAs, sharp/bone reconstruction algorithm, and multiplanar reformatting. Images in mediastinal and lung windows were made available.

All CT images and TH1 chest radiographs were stored in Digital Imaging and Communications in Medicine (DICOM) format and viewed from a work station with a 2 megapixel, medical-grade monitor. TH2 chest radiographs were in conventional films and viewed in view boxes. Six of the volunteers from TH2 had missing lateral chest x-ray views while one patient had missing films.

F. Data Gathering
Independent variable: Clinical data: Episodes of hemoptysis, fever, weight loss and presence of co-morbidities such as diabetes mellitus or malignancy.

Dependent variables: Radiologic patterns in radiographs and CT
Three independent radiologists read the images. Only findings concurrent with at least 2 readers were tallied. The radiologists were blinded to the names of the volunteers to further minimize bias. Each lung in the radiographs was divided into three lung fields. The type of lesions (see "Definition of Terms") seen per lung field were tallied (see list of lung lesions in "Definition of Terms"). As for the CT images, each lung was be divided into lobes: right upper (apical, anterior, and posterior segments) right lower (superior, anterior basal, lateral basal, medial basal and posterior basal segments), right middle (medial and lateral segments), left upper (apicoposterior and anterior segments) left middle (superior lingular and inferior lingular segments) and left lower (superior, anteromedial basal, lateral basal and posterior basal segments). Images of a patients’
radiographs and CT study had separate codenames. The radiographs and CT scans were interpreted at random to minimize recall bias. Another radiologist issued an official reading to be released within 24 hours.

Age, sex, residence (i.e. City and Province), annual gross income (stratified according to current 2010 National Statistics Office (NSO) data) and clinical history were also collected from the patient. As population density has been known to be a precipitating factor in the spread of MDRTB, the population density was taken from the latest population surveys.

G. Data Handling and Analysis

Data were encoded and analysed using statistical software SPSS and Microsoft Excel. Data regarding radiologic findings were analysed using descriptive statistics. The extent of disease per lung field/lobe was defined as the number of lesions per lung field/lobe and graded as minimal (0-2 lesions), moderate (3-5 lesions) and severe (≥6 lesions) using the paired t-test. Pearson correlation was used to test if there was a significant difference in the degree of severity of lesion affection between bilateral lung field/lobes. Descriptive statistics was applied on the socio-clinico-demographic data.

H. Ethics review

Prior to the initiation of the study, an approval from the TH1 radiology department research committee, ethics review board and the PMDT unit chairperson; and TH2 hospital chief, chief training officer, radiology chairperson and PMDT head nurse, were obtained to ensure that the protocol was within ethical boundaries.

I. Funding

This study was funded by the Department of Health through the Centre for Health Development, Region XI.

RESULTS

A total of 41 patients were recruited (TH1: 24, TH2: 17). Only one of the volunteers was known to have been referred by a private medical institution. The rest were charity cases. Table 1 summarizes the clinical sociodemographic profile of the volunteers. Seventy-five per cent of the volunteers are male. Mean age is 41.5±12.29 years with majority (62.5%) belonging to the lowest income bracket and 53.6% are unemployed. The volunteers lived in areas with mean population densities of 2218.57±3918.0 persons per km². Forty per cent live in Davao City. All had a history of cough and a completed previous treatment. The next most common symptoms were chest pain (80%) and dyspnea (70%). Most common co-morbidity was diabetes mellitus (42.5%). Mean duration since start of treatment was 169±180 days with 62.5% within 142 days of treatment. Smoking history was noted in 35%. Table 2 shows the population densities of the areas represented by the volunteers.

In the radiographs, two (2) lateral- and three (3) apicolordotic views were missing among TH2 volunteers and one of them had all films missing. The most common lesions noted were (Figure 1) reticular infiltrates (39%), pleural thickening (13.8%), cavities (9.2%), reticulonodular infiltrates (8.3%), and bronchiectasis (7.8%) (Table 3). In CT, the 5 most

Figure 1. MDRTB most common lesions in X-ray. A, reticular infiltrates (encircled); B, pleural thickening (arrow heads); C, cavities (arrows); D, reticulonodular infiltrates and; E, bronchiectasis.
frequent lesions (in descending order) are pleural thickening (14.03%), tree-in-bud lesions (13.37%) small nodules (11.55%), bronchiectasis (10.89%), and cavities (9.41%) (Table 4, Figure 2).

In X-ray, 27% of the lesions are seen in the right upper lung field, followed by the left upper lung field (22%) and the left middle lung field (14%). In CT, 27% are seen in the right upper lobe, followed by the left upper lobe (17.99%), the right lower lobe (17.66%), left lower lobe (14.03%), the left middle lobe/lingula (11.88%) and the right middle lobe (11.39%). Paired T-test with Pearson correlation showed no significant statistical difference in the severity of extent of lesions between lung fields (X-ray) but with highly significant differences between lobes (CT) (Tables 5 and 6).

Figure 2. MDRTB most common lesions in CT. A, pleural thickening (arrow heads); B, tree-in-bud lesions (encircled); C, small nodules (encircled); D, bronchiectasis (encircled) and cavities (arrow).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Per cent</th>
</tr>
</thead>
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<td><strong>Sex</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
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<td>25.0</td>
</tr>
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<td><strong>Gross annual income</strong></td>
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<td></td>
</tr>
<tr>
<td>&lt;Php62,000.00</td>
<td>25</td>
<td>62.5</td>
</tr>
<tr>
<td>Php62,000-190,000</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Php191,000-602,000</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>Php603,000-1,857,000</td>
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<td>0</td>
</tr>
<tr>
<td><strong>Average Gross Income, ± Std.</strong></td>
<td>Php64,068 ±Php 98,915</td>
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</tr>
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<td><strong>Occupation</strong></td>
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<td></td>
</tr>
<tr>
<td>Blue collar</td>
<td>14</td>
<td>34.1</td>
</tr>
<tr>
<td>White collar</td>
<td>4</td>
<td>9.7</td>
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</tr>
<tr>
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<td>53.6</td>
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<td></td>
</tr>
<tr>
<td>0 to 142 days</td>
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<td>62.5</td>
</tr>
<tr>
<td>143 days to 277 days</td>
<td>8</td>
<td>20.0</td>
</tr>
<tr>
<td>278 days to 547 days</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>548 days to 682 days</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>683 days to 817 days</td>
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<td>2.5</td>
</tr>
<tr>
<td><strong>Average days of treatment, ±</strong></td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Fever</td>
<td>18</td>
<td>45.0</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>23</td>
<td>57.5</td>
</tr>
<tr>
<td>Night sweats</td>
<td>21</td>
<td>52.5</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>28</td>
<td>70.0</td>
</tr>
<tr>
<td>Chest pain</td>
<td>32</td>
<td>80.0</td>
</tr>
<tr>
<td>Significant weight loss</td>
<td>21</td>
<td>52.5</td>
</tr>
<tr>
<td><strong>Previous treatment</strong></td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Incomplete</td>
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<tr>
<td>Completed</td>
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<td>100</td>
</tr>
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<td><strong>Co-morbidities</strong></td>
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<td></td>
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<tr>
<td>Diabetes mellitus</td>
<td>17</td>
<td>42.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Kidney disease</td>
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<td>2.5</td>
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<td><strong>Social History</strong></td>
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<tr>
<td>Smoking</td>
<td>14</td>
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</tr>
<tr>
<td>Substance abuse</td>
<td>7</td>
<td>17.5</td>
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</table>
### Table 2. Population Densities of Participants' Areas of Residence

<table>
<thead>
<tr>
<th>Province / Municipality</th>
<th>Frequency (%)</th>
<th>Population Density (Persons/Km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compostela Valley</td>
<td>7 (17.5)</td>
<td>137.30</td>
</tr>
<tr>
<td>Davao City</td>
<td>16 (40)</td>
<td>593.10</td>
</tr>
<tr>
<td>Davao Del Norte</td>
<td>10 (25)</td>
<td>275.98</td>
</tr>
<tr>
<td>Davao Del Sur</td>
<td>3 (7.5)</td>
<td>200.74</td>
</tr>
<tr>
<td>Davao Oriental</td>
<td>2 (5.0)</td>
<td>50.11</td>
</tr>
<tr>
<td>Quezon Province</td>
<td>1 (2.5)</td>
<td>240.00</td>
</tr>
<tr>
<td>Surigao Del Sur</td>
<td>1 (2.5)</td>
<td>5685.32</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40 (100)</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Frequency of Lesions per Lung Field

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Right Upper</th>
<th>Left Upper</th>
<th>Right Middle</th>
<th>Left Middle</th>
<th>Right Lower</th>
<th>Left Lower</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess</td>
<td>0 (0.0)</td>
<td>1 (2.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>8 (13.6)</td>
<td>2 (4.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (5.9)</td>
<td>2 (15.4)</td>
<td>13 (6.0)</td>
</tr>
<tr>
<td>Bulla</td>
<td>1 (1.7)</td>
<td>3 (6.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>4 (1.8)</td>
</tr>
<tr>
<td>Cavity</td>
<td>10 (16.9)</td>
<td>7 (14.3)</td>
<td>1 (5.3)</td>
<td>1 (5.9)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>13 (9.2)</td>
</tr>
<tr>
<td>Consolidation</td>
<td>2 (3.4)</td>
<td>1 (2.0)</td>
<td>0 (0.0)</td>
<td>2 (6.7)</td>
<td>1 (5.9)</td>
<td>0 (0.0)</td>
<td>6 (2.8)</td>
</tr>
<tr>
<td>Cavity</td>
<td>5 (8.5)</td>
<td>3 (6.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>8 (3.7)</td>
</tr>
<tr>
<td>Fibrothorax</td>
<td>0 (0.0)</td>
<td>1 (2.0)</td>
<td>0 (0.0)</td>
<td>2 (6.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>5 (2.3)</td>
</tr>
<tr>
<td>Ground Glass Opacity</td>
<td>0 (0.0)</td>
<td>1 (2.0)</td>
<td>1 (5.3)</td>
<td>2 (6.7)</td>
<td>2 (11.8)</td>
<td>0 (0.0)</td>
<td>6 (2.8)</td>
</tr>
<tr>
<td>Nodule, Large</td>
<td>2 (3.4)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Nodule, Small</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (3.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Reticular Infiltrate</td>
<td>23 (39.0)</td>
<td>23 (46.9)</td>
<td>13 (68.4)</td>
<td>13 (43.3)</td>
<td>10 (58.8)</td>
<td>3 (23.1)</td>
<td>85 (39.0)</td>
</tr>
<tr>
<td>Reticulonodular</td>
<td>3 (5.1)</td>
<td>2 (4.1)</td>
<td>4 (21.1)</td>
<td>5 (16.7)</td>
<td>1 (5.9)</td>
<td>3 (23.1)</td>
<td>18 (8.3)</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>4 (6.8)</td>
<td>5 (10.2)</td>
<td>0 (0.0)</td>
<td>4 (13.3)</td>
<td>1 (5.9)</td>
<td>3 (23.1)</td>
<td>17 (7.8)</td>
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<tr>
<td>Empyema-Pl</td>
<td>1 (1.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59 (27)</strong></td>
<td><strong>49 (22)</strong></td>
<td><strong>19 (9)</strong></td>
<td><strong>30 (14)</strong></td>
<td><strong>17 (8)</strong></td>
<td><strong>13 (6)</strong></td>
<td><strong>187 (85.8)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesion</th>
<th>RIGHT</th>
<th>LEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleural Effusion</td>
<td>1 (7.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Pleural Thickening</td>
<td>13 (92.9)</td>
<td>17 (100)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14 (100)</strong></td>
<td><strong>17 (100)</strong></td>
</tr>
</tbody>
</table>
Table 4. Frequency of Lesions per Lung Lobe

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Right Upper</th>
<th>Right Middle</th>
<th>Right Lower</th>
<th>Left Upper</th>
<th>Left Middle</th>
<th>Left Lower</th>
<th>TOTAL</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.17%</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>36</td>
<td>5.94%</td>
</tr>
<tr>
<td>Bulla</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>20</td>
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<tr>
<td>Cavity:</td>
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<td>4</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>8</td>
<td>57</td>
<td>9.41%</td>
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<tr>
<td>Emphysema</td>
<td>16</td>
<td>4</td>
<td>5</td>
<td>12</td>
<td>3</td>
<td>7</td>
<td>47</td>
<td>7.76%</td>
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<tr>
<td>Fibrosis</td>
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<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>0.99%</td>
</tr>
<tr>
<td>Fibrothorax</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.33%</td>
</tr>
<tr>
<td>Ground-glass opacity</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>17</td>
<td>2.81%</td>
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<tr>
<td>Milliary PTB</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Nodule, large</td>
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<td>1</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>2.81%</td>
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<tr>
<td>Nodule, small</td>
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<td>7</td>
<td>12</td>
<td>14</td>
<td>10</td>
<td>12</td>
<td>70</td>
<td>11.55%</td>
</tr>
<tr>
<td>Reticular infiltrate</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>23</td>
<td>3.80%</td>
</tr>
<tr>
<td>Reticulonodular</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>23</td>
<td>3.80%</td>
</tr>
<tr>
<td>Air bronchogram:</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>1.32%</td>
</tr>
<tr>
<td>Bronchiectasis:</td>
<td>19</td>
<td>6</td>
<td>8</td>
<td>13</td>
<td>11</td>
<td>9</td>
<td>66</td>
<td>10.89%</td>
</tr>
<tr>
<td>Calculifcation:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Granuloma:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Tree-in-bud:</td>
<td>13</td>
<td>13</td>
<td>18</td>
<td>12</td>
<td>14</td>
<td>11</td>
<td>81</td>
<td>13.37%</td>
</tr>
<tr>
<td>Bleb:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0.33%</td>
</tr>
<tr>
<td>Calcification:</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
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</tr>
<tr>
<td>Granuloma:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
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<tr>
<td>Loculated effusion:</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.33%</td>
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<tr>
<td>Pleural effusion:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Empyema:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Pleural thickening:</td>
<td>17</td>
<td>13</td>
<td>17</td>
<td>14</td>
<td>11</td>
<td>13</td>
<td>85</td>
<td>14.03%</td>
</tr>
<tr>
<td>Pneumothorax:</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0.83%</td>
</tr>
<tr>
<td>Lymphadenopathy:</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>29</td>
<td>4.79%</td>
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<td>Pericardial effusion:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Per cent</td>
<td>27.06%</td>
<td>11.39%</td>
<td>17.66%</td>
<td>17.99%</td>
<td>11.88%</td>
<td>14.03%</td>
<td>100.00%</td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Extent of Lesion By Radiographic Findings (X-Ray)

<table>
<thead>
<tr>
<th>Extent of Lesion</th>
<th>Right Upper</th>
<th>Left Upper</th>
<th>Right Middle</th>
<th>Left Middle</th>
<th>Right Lower</th>
<th>Left Lower</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>37 (92.5%)</td>
<td>40 (100%)</td>
<td>40 (100%)</td>
<td>40 (100%)</td>
<td>40 (100%)</td>
<td>38 (95%)</td>
<td>0.055</td>
</tr>
<tr>
<td>Moderate</td>
<td>3 (7.5%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>2 (5%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Extent of lesions by Radiologic Findings (CT Scan)

<table>
<thead>
<tr>
<th>Extent of Lesion</th>
<th>Upper Right Lobe</th>
<th>Middle Right Lobe</th>
<th>Lower Right Lobe</th>
<th>Upper Left Lobe</th>
<th>Middle Left Lobe</th>
<th>Lower Left Lobe</th>
<th>Pearson Chi-Square (P-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>20 (48.8%)</td>
<td>23 (76.7%)</td>
<td>19 (59.4%)</td>
<td>18 (53%)</td>
<td>27 (87%)</td>
<td>14 (51.2%)</td>
<td>0.009</td>
</tr>
<tr>
<td>Moderate</td>
<td>18 (43.9%)</td>
<td>7 (23.3%)</td>
<td>12 (37.5%)</td>
<td>16 (47%)</td>
<td>4 (13%)</td>
<td>13 (48.8%)</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>3 (7.3%)</td>
<td>0</td>
<td>1 (3.1%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>30</td>
<td>32</td>
<td>34</td>
<td>31</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

The results that MDRTB is characterised by pleural thickening, bronchiectasis, nodules, cavities, and tree-in-bud lesions have many points in common with the findings of other studies. All studies, including this research, have multiple cavities as one of the most common features. Lung volume loss as a common feature in MDRTB were also noted in other studies but is not prominent in this paper at only 5.94% of lesions. HRCT detected 606 lesions compared to 218 in radiographs, further stressing the higher sensitivity of HRCT due to its excellent spatial resolution. In the official interpretation, three cases had findings compatible with fungus balls while another three had findings suggestive of neoplasms, none of which were even hinted at in their accompanying radiographs. These are findings that could significantly alter management and save the patient from further morbidity or mortality.

The right upper lobe was seen to have significantly the most number of lesions, regardless of severity. All of the cited references in this study have only mentioned which lesions are present among MDRTB but none have made any analysis on lesion distribution and all of them did not mention any study that made such an analysis. This paper therefore suggests that MDRTB have lesions predominantly in the right upper lobe, but as for the predominant type of lesion, no significant correlation has been made.

Clinical and sociodemographic findings show that MDRTB affects the lowest income class and the more densely populated areas more, also in agreement with Rivera et al. and Atre, SR et al. Majority of the patients are from Davao City which is the second most populated among the areas represented by the volunteers. The most populated area represented was Surigao del Sur but is not within Region XI and is considered as an outlier. All of the participants have histories of failed treatment and mostly are young adults, in agreement with other studies. Diabetes mellitus and smoking are further established as risk factors for TB in general.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the most frequent lesions found in X-ray were reticular infiltrates, pleural thickening, cavities, reticulonodular infiltrates, and bronchiectasis; while on CT, the most common were pleural thickening, tree-in-bud lesions, small nodules, bronchiectasis and cavities. The most severely affected were the right upper lung field and right upper lobe in the X-ray and CT, respectively. This study further validates the value of HRCT in evaluating lung disease. With its exceptional spatial resolution, it is an invaluable adjunct in determining the lesions present and their distribution. This study recommends its use for cases who had completed but failed anti-TB regimens and are therefore suspicious for MDRTB. The presence of pleural thickening, bronchiectasis, nodules, cavities, and tree-in-bud lesions with predilection to the right lobe further supports the diagnosis of MDRTB. Chest radiographs remain as screening procedures, as far as this study is concerned. A multi-center, nation-wide study is recommended to reach a more statistically sound sample size and reach a more definite conclusion. Future studies may involve defining statistical differences between lobes in terms of severity and frequency of lesions to further establish radiologic patterns of MDRTB. Differences in patterns may be investigated within MDRTB cases of different treatment durations, e.g. between cases beginning treatment, midway and after. It is also recommended that studies involving DSTB cases be included and their images compared to the MDRTB studies to
determine differences in radiologic patterns. An investigation can then be made on the predictive value of images in the diagnosis of DSTB and MDRTB, i.e. radiologists read images blinded to the culture and DST and/or GeneXpert results of each corresponding case.

It was observed that there were discrepancies in the lesions identified between each reader. Inter-observer variability can be studied and its causes identified and addressed in succeeding researches.

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2. Kim, SH, Min, JH and Lee, JY Radiological Findings of Primary Multidrug-resistant Pulmonary Tuberculosis in HIV-seronegative Patients. Hong Kong J Radiol. 2014;17:4-8
19. Kim, SH, Min, JH and Lee JY. Radiological Findings of Primary Multidrug-resistant Pulmonary Tuberculosis in HIV-seronegative Patients. Hong Kong J Radiol. 2014;17:4-8

APPENDIX: DEFINITION OF TERMS

**Clinical terms**

**Hemoptysis:** expectoration of blood-tinged sputum or blood

**Fever:** axillary temperature of 37.8°C or higher

**Significant weight loss:** weight loss of ≥5% in 30 days or ≥10% in 6 months

**Lung lesions (Radiographs)**

**Abscess:** spherical opacities with air-fluid levels

**Air-bronchogram:** air within bronchial tree with surrounding airless parenchyma

**Atelectasis:** volume loss associated with increased density, fissure deviation, and/or hyperinflation of the adjacent lung parenchyma or contralateral lung

**Bronchiectasis:** thick-walled bronchi filled with air that stands out in contrast to the surrounding diseased lung demonstrating a reticular pattern
**Bulla**: intrapulmonary air-filled cyst with no discernible walls >1cm in diameter

**Calcification**: calcium-containing density

**Cavity**: an air-filled space within a pulmonary consolidation, mass or nodule

**Cicatricial changes**: volume loss secondary to fibrosis

**Consolidation**: a dense shadow devoid of a vascular pattern and conforms to the volume of lung. This at least affects a segment.

**Emphysema**: overinflated areas with small peripheral vessels

**Empyema**: thickened visceral and parietal pleura with pleural fluid

**Fibrosis**: appear as streaky infiltrates in the lung parenchyma

**Fibrothorax**: extensive fibrosis, calcification, pleural thickening, bronchiectasis and loss of lung volume

**Fungus ball**: a roughly spherical nodule or mass separated by a crescent-shaped area of decreased opacity from the adjacent cavity wall

**Granuloma**: well-defined small calcification

**Ground-glass opacity (GGO)**: an area of hazy increased lung opacity, within which margins of pulmonary vessels may be indistinct

**Loculated effusion**: encapsulated pleural effusion

**Lymphadenopathy**: enlarged lymph nodes

**Milliary PTB**: fine granular or tiny nodular opacities (1-2mm) scattered throughout the lungs

**Nodule, large**: well-defined, round-to-ovoid lesion 10mm to 30mm in size

**Nodule, small**: well-defined, round-to-ovoid lesion <10mm in size

**Pleural effusion**: fluid collection within the pleural space

**Pericardial effusion**: fluid collection within the pericardial space

**Pleural thickening**: pleura of ≥1mm thickness

**Pneumothorax**: area of lucency devoid of lung markings within the periphery of the lung

**Reticular infiltrate**: a net-like opacity

**Reticulonodular pattern**: admixture of reticular and nodular opacities

**Tree-in-bud**: centrilobular nodules less than 10 mm in diameter and branching nodular structures within a secondary pulmonary lobule

**Lung lesions (CT)**

**Abscess**: spherical opacities with air-fluid levels

**Air-bronchogram**: air within bronchial tree with surrounding airless parenchyma

**Atelectasis**: volume loss associated with increased density, fissure deviation, and/or hyperinflation of the adjacent lung parenchyma or contralateral lung

**Bleb**: cystic air collection within the visceral pleura seldom exceeds 1-2cm in diameter

**Bronchiectasis**: thick-walled bronchi filled with air that stand out in contrast to the surrounding diseased lung demonstrating a reticular pattern

**Bulla**: intrapulmonary air-filled cyst with no discernible walls >1cm in diameter

**Calcification**: calcium-containing density

**Cavity**: an air-filled space within a pulmonary consolidation, mass or nodule

**Cicatricial changes**: volume loss secondary to fibrosis

**Consolidation**: a dense shadow devoid of a vascular pattern and conforms to the volume of lung. This at least affects a segment.
CT ENHANCEMENT PATTERN OF BIOPSY - PROVEN PROSTATE CANCER

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ANATOLE J. GARCIA, MD, FPCR, FCTMRI
Davao Doctors Hospital
Davao City

ABSTRACT

Objective: This study primarily described the CT enhancement of the prostate gland in biopsy proven prostate cancer. Specifically, it was to find a correlation between the enhancement, Gleason score, and PSA level.

Methods: This was a retrospective study gathering information from the data base of the Departments of Pathology, Radiation Oncology, and from the picture archiving system of the Department of Radiology. Thirty patients had available PSA level, Gleason score, and contrast enhanced CT scan of the abdomen/pelvis that were within 6 months of each other. The non-prostate protocol CT scan images of the patients were reviewed and the enhancement of the prostate from the plain study were noted. Other pelvic findings such as nodal and bone metastases, extracapsular, urinary bladder, and seminal vesicle involvement were observed. Review of the final reports was also done. Patients were stratified according to National Comprehensive Cancer Network (NCCN) PSA risk and Gleason score (GS) risk. Correlation was sought among enhancement, PSA level, GS, reported abdominal findings, and reviewed pelvic findings using Pearson correlation test. Receiver operating characteristics curve was used to determine the enhancement cut-off point that would discriminate a patient with PSA level >10 ng/ml and Gleason score > 6.

Results: Patients’ age ranged from 50 to 92 years old with a mean of 68.6 years. The PSA level ranged from 0.43 ng/ml to 112.9 ng/ml with a mean of 46.9 ng/ml. GS had a range of 2 to 9 with a mean of 6. Fifty percent (50%) had no treatment at the time of scan while 7 (23.3%) took antiandrogen drugs, 4 (13.3%) had transurethral resection of the prostate (TURP), 1 (3.3%) TURP and orchiectomy, 2 (6.67%) had hormonal therapy, and 1(3.3%) had hormonal and radiation therapy. Nine (30%) had PSA levels that belonged to NCCN low risk, 3 (10%) intermediate risk, 18 (60%) high risk. For the GS NCCN risk, 13 (43.3%) were low risk, 7 (23.3%) intermediate risk, and 10 (33.3%) high risk. The enhancement of the prostate gland ranged from 1 to 45 HU with a mean of 21 HU. The contrast enhanced images had peripheral and central zones identified with enhancement of either heterogeneous or homogeneous pattern. There was a strong correlation between PSA level and enhancement while a weak correlation exists between GS and enhancement. There was no correlation between the abdominal findings, PSA level, GS, and enhancement. The nodal involvement, urinary bladder and seminal vesical extension had a strong correlation with PSA level. The enhancement and extracapsular involvement also had a strong positive relationship. Gleason score did not correlate with the pelvic findings. At cut-off score of 25 HU, the enhancement from the plain study had a strong discriminatory power for Gleason score of >6 and PSA level >10 ng/ml with sensitivity of 100% and a specificity of 80%.

Conclusion: CT enhancement pattern of the prostate gland during a non-prostate CT imaging may help the physician become aware of a prostate pathology other than its primary indication of the procedure.
OBJECTIVES: Anatomical variants of the hepatic arteries and celiac trunk are of particular concern to interventional radiologists and liver surgeons in planning for transplant or transarterial chemoembolization and/or resection of hepatocellular carcinoma. It is the goal of this study to determine as to whether the standard triphasic CT scan protocol can be used to evaluate the variations in arterial anatomy of the celiac trunk in patients with hepatocellular carcinoma, and compare the findings with the results of conventional catheter angiography.

METHODS: The triphasic CT scans of these patients were done using a 256 multidetector Philips iCT scanner, using a dedicated triphasic protocol as follows: non-enhanced scan; arterial phase scan at 20 seconds after contrast injection; portal venous phase scan at 30 seconds after contrast injection, and delayed phase scan at 5 minutes after contrast injection. The volume of contrast medium used for each patient was computed at 1 ml per kilogram weight. Digital subtraction angiography was performed via a transfemoral approach. Selective celiac and superior mesenteric artery injections were performed, prior to target embolization. Anatomical variations of the celiac trunk were described according to the system devised by Uflacker.

RESULTS: A total of 23 subjects were included in the study consisting of 6 females (26%) and 17 males (74%). Using conventional triphasic liver scans, majority of the subjects (65%) had a classic celiac trunk. The most common celiac trunk variants were types III and IV. The computed sensitivity and specificity of triple phase liver scans using conventional catheter angiography as gold standard are 67% and 70%, respectively. The computed strength of agreement using weighted Cohen kappa coefficient is 0.396 which is considered fair.

CONCLUSION: The anatomic variations of the celiac trunk were clearly delineated using the triphasic liver scans. However, it has a relatively low sensitivity and specificity using conventional catheter angiography as gold standard. There is fair strength of agreement between triphasic liver scans and conventional catheter angiography with regard to identification of celiac trunk variations.
CRANIAL MRI FINDINGS AMONG PATIENTS WITH UNPROVOKED SEIZURE IN THE UP-PGH

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Manila

ABSTRACT

It is estimated that around five in every 100 will have seizure at some time in their life. Provoked seizures are those events that result from some immediately recognizable stimulus or cause. In contrast, unprovoked seizures do not require an immediate precipitating event. Hence, its occurrence suggests the possibility of an underlying neurological disorder that may predispose a patient to recurrent seizures.

The two most widely employed imaging techniques utilized in the initial evaluation of seizures are CT scan and MRI. MRI yields a more detailed image of structural abnormalities without radiation exposure, might need sedation, and is not always available in all institutions. Patients with known metabolic disorder, mental retardation, or intracranial lesion; history of trauma, stroke, cancer, drug or alcohol addiction or previous cranial surgical operations; and those whose seizure may have resulted from fever/infection, those who manifest a chronic illness that would limit their activities of daily living such as cerebral palsy as well as those whose seizures are provoked by poisoning are excluded from the study.

Forty-one patients with unidentified cause of seizure were included in the study, 16 females and 25 males. Among the 41 patients, 56% revealed abnormal cranial MRI findings. One third of the patients with cranial abnormality presented with mesial temporal sclerosis on imaging.
EVALUATION OF SUSPECTED RENAL COLIC WITH NON CONTRAST CT: A THREE-YEAR SINGLE INSTITUTION REVIEW

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Institute of Radiology and Allied Sciences
University of Perpetual Help DALTA Medical Center
Las Piñas City

ABSTRACT

Background: Non contrasted helical CT scan is the main stay diagnostic tool in the detection of stones in the kidneys, ureters and urinary bladder (KUB).

Objective: The study aims to describe the profile of urolithiasis diagnosed by computed tomography (stonography) from 2012-2014 at the UPHDMC.

Study Design: Retrospective study review of records

Materials And Methods: Patient records and official stonogram reports from 2012-2014 were reviewed for demographic data, KUB stone frequency, location and size and overall detection rate. Other incidental findings were also included.

Results: A total of 270 patients who underwent CT-stonography were reviewed. A total of 404 stonograms from this patient sample comprised the analysis. The detection rate of CT stonography was 66.8% (270 out of 404). Patients were mostly males (62.5%) in their 4th decade of life (range 17-94). Stones were detected mostly in the upper collecting system (calyces, ureter). Calyceal stones were larger (1.5-3.75 cms); ureteral (0.3 to 0.44 cm); kidney (0.28-0.75 cm); uterovesical junction (0.4 to 0.8 cm); ureteropelvic junction (1.8 to 2.2 cm); ureterovesical junction (0.4 to 0.8 cm) and urinary bladder stones (1.1 cm).

Conclusion: CT scan remains to be the test of choice for urolithiasis detection. Correlation of findings with medico-surgical decisions must be sought.
DELAYED ADVERSE CONTRAST REACTIONS TO GADOLINIUM-BASED AGENTS: A ONE-YEAR RETROSPECTIVE SINGLE-CENTER ANALYSIS

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ABSTRACT

Objective: Gadolinium-based contrast media are generally well-tolerated; and adverse contrast reactions (ACRs) to gadolinium are known to be less encountered when compared to iodinated contrast media. There are several studies about acute ACRs in the literature but there is lack of data regarding delayed ACRs to gadolinium. The objective of this paper is to determine the incidence of delayed ACRs, assess some risk factors and outcomes in patients who underwent contrast-enhanced magnetic resonance imaging (MRI) studies at St. Luke’s Medical Center, Bonifacio Global City, Philippines.

Methods: Databases of all patients to whom gadolinium contrast media were administered from November 2013 to October 2014 were reviewed. The databases contain previous records of responses from patients and/or their relatives, wherein unusual reactions experienced by the patient one hour after the procedure were logged by the nurses as part of the department’s safety protocol. For each response, the patient’s age, gender, allergy history, type of study, type and volume of gadolinium contrast used, severity of reactions and chief complaint/s to the studies were recorded. The severity of ACRs was categorized initially using the Naranjo criteria. Moreover, those with the same symptom/s as the primary complaint/s prior to the procedure and those not included in the list of adverse reactions for each contrast medium were considered doubtful.

Results: A total of 2133 patients received gadolinium during the study period. 873 out of 936 respondent patients (93.27%) had no delayed ACRs. 63 out of the 936 respondent patients (6.73%) had at least one symptom after the procedure. 51 were considered to be possible ACRs (5.45%), with age ranging from 10 months to 83 years old, and a female to male ratio of 2:1. 12 responses were considered as doubtful reactions. 50 out of 51 (98.04%) were mild and non-life threatening. One patient had a moderate reaction presenting as exacerbation of known asthma. All patients were managed conservatively. No severe, life threatening reaction was recorded. The common manifestations of delayed ACRs were headache (29.41%), dizziness (17.65%), and skin rash (13.73%). The procedures that gave the highest rates of delayed ACRs are brain (6.06%), abdomen (4.29%) and spine (4.17%). 52.94% of the possible reactions have at least one food or drug allergy. Gadopentetate had the most delayed reactions (7.87%). The rest were noted in Gadobutrol (5.80%), gadoxetate (5%) and gadoversetamide (3.33%). The amount of contrast administered to each patient ranged from 1 to 19 cc; 25.49% of the ACRs received 10 cc or more.

Conclusions: This retrospective analysis demonstrates that gadolinium-based contrast agents are relatively safe, but likewise validates the potential for delayed adverse contrast reactions. Although most reactions are mild and non-life threatening, continued increase in the use of contrast-enhanced MRI advocates the need for greater awareness, and more vigorous data gathering and reporting. The overall incidence of delayed ACRs is 5.45%; almost all were mild. Based on this study, no apparent risk factors were identified.
PREVALENCE OF FETAL VARIANT OF THE CIRCLE OF WILLIS AMONG ADULT FILIPINOS WITH NEUROLOGICAL CONDITIONS IN A TERTIARY HOSPITAL: A RETROSPECTIVE STUDY

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Espana, Manila

ABSTRACT

Background: The circle of Willis is the major source of blood supply to the brain, the anatomy of which is highly variable. The fetal variant of the posterior cerebral artery is a common anatomic variant, but despite it being a common variant, its prevalence among Filipinos and how this impacts ischemic stroke characteristics remain unknown.

Purpose: To determine the prevalence of fetal posterior cerebral artery among Filipinos with neurological conditions and to determine if it affects stroke prevalence and distribution.

Methodology: A retrospective study of the 3-D time-of-flight magnetic resonance angiogram (MRA) of patients who underwent cranial MRI with MR Angiography from January 2012 to December 2013 in a tertiary hospital, presenting with neurologic symptoms was done. The findings were reviewed and tabulated (demographic data, presence of a fetal variant posterior cerebral artery, lateralization of the variant, associated stroke and relevant vascular distribution) and were ascertained by a certified neuroradiologist.

Statistics: Demographic data was expressed as means and / or standard deviations. The age, sex and symptom related differences in patients with fetal type posterior cerebral artery were evaluated using both the Z-Test and Chi Square Test using a significance value (p-value) of <0.05. The laterality of the fetal variant of the posterior cerebral artery was also assessed, as well as if there was an associated stroke, including the relevant vascular stroke distribution.

Results: Of the 727 included patients, 77 (11%) had fetal variant posterior cerebral artery. Unilateral fetal variant was more common, occurring more often on the right side (59%). There was no significant difference in the incidence of fetal variant PCA among males and females and among age groups, as well as in the presenting symptoms of these patients. 52% (40) of the patients had concomitant stroke, small vessel affectation being more common. There was no significant difference in the incidence of concomitant stroke occurring ipsilateral or contralateral to a fetal variant posterior cerebral artery.

Conclusion: The fetal type posterior cerebral artery is a relatively common anatomic variant, occurring in about 10% of Filipinos presenting with neurologic symptoms. Unilateral fPCA is more common, with most cases occurring on the right side. The prevalence of this variant does not significantly vary among males or females. There is no direct association between the presence of a fetal type posterior cerebral artery and the development of stroke, neither is it associated with a particular vascular distribution of stroke affectation.
CORRELATION OF THE CHEST RADIOGRAPHIC FINDINGS WITH THE PLATELET COUNT AND HEMATOCRIT LEVELS IN PEDIATRIC PATIENTS WITH DENGUE INFECTION

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ABSTRACT

Purpose: Dengue infection is a mosquito-borne disease found in tropical and sub-tropical regions that has now become endemic in more than 100 countries. In the Philippines, dengue disease is observed year-round. The Philippines was one of the countries with the highest number of dengue cases and deaths in the Western Pacific in 2008, and cases were reported in every region with outbreaks in several provinces and municipalities in 2010. This study is then to describe the various chest x-ray findings in pediatric patients with dengue infection and correlate these with blood parameters such as the platelet count and hematocrit levels.

Materials and Methodology: All pediatric patients (less than 19 years of age) with either a dengue NS1 antigen test or dengue IgM-capture-ELISA who also have at least one chest x-ray in St. Luke’s Medical Center – Global City from January 1, 2013 to January 31, 2015 was included and reviewed by three pediatric radiologists. Chest radiographs were reviewed for the presence of hyperaeration, hypoaeration, increased interstitial markings, venous congestion (interstitial edema) and alveolar edema. The presence of air space-filling opacities (hazy / patchy / poorly-outlined and coalescent / consolidated opacities) or atelectasis in 3 lung zones (upper, middle and lower lung zone) in each side as well as pleural effusion (right, left or bilateral and categorized as minimal, moderate, large or massive) were assessed. These were correlated with the hematocrit and platelet levels.

Results: Majority of patients with dengue infection presented with normal chest radiographs. The most common abnormal chest radiographic finding is pleural effusion. The incidence of pleural effusion increases with decreasing platelet count and increasing hematocrit levels. Patients with serial studies demonstrate increasing severity of pleural effusion as the platelet count drops. Other abnormal findings include venous congestion, air-space opacities and atelectasis.

Conclusion: Chest radiography remains a relatively cheap but useful tool in the work-up and follow-up of dengue infection in children. Patients with dengue infection still predominantly have normal chest radiographic findings. Otherwise, the most common abnormal finding is minimal pleural effusion which manifests with decreasing platelet count and increasing hematocrit levels. These changes in the radiographic findings may be helpful for the pediatricians in the prognostication of patients with dengue infection.

Recommendation: Inclusion of the clinical dengue category as well as the white blood cell count of the patients may be done in the future studies.
ASSESSMENT OF THE INCIDENCE OF SINONASAL ANATOMIC VARIANTS AND THEIR RELATIONSHIP TO SINONASAL DISEASES IN ADULT PATIENTS OF ST. LUKE’S MEDICAL CENTER QUEZON CITY: A MULTIPLANAR PARANASAL SINUS CT SCAN REVIEW

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ABSTRACT

Background: Functional Endoscopic Sinus Surgery (FESS) is a common procedure, which requires a meticulous assessment of patient and a detailed radiological description of the anatomy and its anatomic variations in the paranasal sinus. Knowledge of these variations in every patient is important before surgery is planned to avoid damage to surrounding vital structures like the orbit and the brain. Computed Tomography (CT) of the paranasal sinuses (PNS) has nowadays become the investigation of choice for the radiological diagnosis of sinonasal diseases.

Objectives: This study was aimed to report the frequency of sinonasal anatomic variants and their incidence in patients with sinonasal symptoms who underwent paranasal sinus CT scan.

Materials and Methods: The retrospective study was conducted at St. Luke’s Medical Center, Quezon City, and comprised of Computed Tomography scans of 847 patients who had presented from January 2012 to December 2014. All the scans were reviewed using Picture Archiving Communication System computer software. The scans were reviewed for the presence or absence of mucosal sinus disease, nasal septal deviation, paradoxical middle turbinate, Concha bullosa, Agger nasi cells, Haller cells and Onodi Cells.

Results: Among the different sinonasal anatomic variants, nasal septal deviation and Haller cells were significantly associated with sinonasal disease in all sinuses (right/left frontal, right/left ethmoid, right/left maxillary and sphenoid sinuses). On the other hand, Concha bullosa and Onodi cells were only associated with sphenoid sinonasal disease alone.

Conclusions: There is a strong association between the presence of most of these variants and the development of sinonasal diseases.
EXPERIMENTAL COMPARISON OF THE ACCURACY OF TWO OPEN SOURCE (3D Slicer and Fiji ImageJ) AND COMMERCIAL (Philips Intellispace Portal) SOFTWARE APPLICATION IN DETERMINING THE VOLUME OF SOLID ELEMENTS IN AN AGAR BASED PHANTOM

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ABSTRACT

Background: The determination of the volume of various normal and pathologic structures in cross-sectional imaging studies is important in the diagnosis and management of several disease entities. Volumetry using dedicated equipment connected to scanners has long been used as the gold standard in determining object volumes in CT scans. The disadvantages of this method are high system cost and lack of mobility. To provide a possible alternative, the author evaluated the accuracy of two open source software packages, namely Fiji and 3D Slicer or "Slicer" that can perform the same operations using a personal computer.

Objectives: The main objective of this study is to compare the accuracy of two open source (Fiji and 3D Slicer) and a commercial (Philips Intellispace Portal) image processing software in determining the volume of solid elements embedded in an agar based phantom. This can be broken down to the following specific objectives: 1. construct phantoms containing solid elements of predetermined volumes, 2. determine the volume of the elements using the three software packages and 3. determine and compare the accuracy of the three methods.

Methods: Thirty cylindrical elements with volumes ranging from five to 77.5 cc were cut from engineering plastic (Polyamide-Nylon) rod stock. They were randomly embedded into three agar-based phantoms with each phantom containing 10 elements arranged in two layers. The phantoms were scanned using a Siemens Somatom Emotion 16 slice CT scanner using 2mm slice thickness and 1.5 mm scanning interval. The volumes of the individual elements were determined three times each for the three software packages. The absolute percent error between the volume obtained using the different software packages and the actual volume of the cylinder were compared.

Results: The obtained data had a non-normal distribution. The computed medians and their 95% confidence intervals are as follows: Fiji - 2.74% (1.05 to 4.52%), Slicer 1.08% (0.09 to 1.50%) and Intellispace 2.85% (2.54 to 3.135%). Statistical analysis using the Kruskal-Wallis test showed statistically significant difference between the three groups ($p$ = 0.0004). Pairwise comparison using the Mann-Whitney test showed statistically significant lower error rates for Slicer compared to Intellispace ($p$ < 0.001) and Slicer compared to Fiji ($p$ = 0.005) while no significant difference between Intellispace and Fiji ($p$ = 0.8016) was seen.

Conclusion: In conclusion, Slicer is statistically more accurate than Intellispace ($p$ < 0.001) and Fiji ($p$ = 0.005) while Intellispace and Fiji have no statistically significant difference in their accuracy ($p$ = 0.802) in determining volumes of the solid test elements.
CORRELATION OF CT RENAL PARENCHYMAL VOLUME AND DIFFERENTIAL RENAL FUNCTION USING RADIONUCLIDE SCAN IN THE EVALUATION OF PATIENTS WITH CHRONICALLY OBLITERATED KIDNEYS

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ABSTRACT

**Purpose:** CT scan offers a good anatomic picture of the renal parenchymal changes in patients with chronic obstruction. However, nuclear renal scan is the current gold standard for determining renal function. The study aims to determine the correlation between renal parenchymal volumes by CT scan with renal function using nuclear studies.

**Methods:** A total of 53 patients with chronically obstructed kidneys were identified from the hospital’s Nuclear Medicine and CT scan sections. The CT images acquired were used to obtain the renal parenchymal volume and percent renal volume through a semi-automated method using a volume rendering application. This was then correlated with the differential renal function as determined by nuclear renal scan.

**Results:** The measurement of renal parenchymal volume and percent renal volume by CT scan had an acceptable and high internal consistency. Percent renal volume by CT scan and differential renal function by nuclear studies are highly and closely related to each other.

**Conclusion:** CT-based measurement of renal parenchymal volume and percent renal volume offer a reliable and efficient diagnostic tool in providing anatomy and function of chronically obstructed kidneys.
COMPUTED TOMOGRAPHY FEATURES OF HEPATIC TUBERCULOSIS IN PATIENTS CLINICALLY DIAGNOSED WITH PULMONARY TUBERCULOSIS

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ABSTRACT

Background: The incidence of hepatic tuberculosis has been increasing through the years in the Philippines. Computed Tomography (CT) scan has been recommended to be the radiographic test for diagnosing hepatic TB because it is highly sensitive but relatively non-specific in its form.

Objective: The primary aim of the study is to describe the CT imaging features of clinically diagnosed pulmonary tuberculosis patients with hepatic tuberculosis treated with anti-TB drugs.

Methods: There are 2492 patients who underwent chest computed tomography in the Philippine Lung Center from 2009 to 2011. Of these, 751 patients were clinically diagnosed with pulmonary tuberculosis based from sputum tests and chest scan. From the latter group, 46 patients have liver lesions suggestive of hepatic TB on initial evaluation. The 24 patients who have liver lesions and showed regression of signs and symptoms after taking anti-TB medications after 6-9 months were included. Contrast-enhanced CT scan of the chest with high resolution images were obtained using standard scanning protocol (slice thickness of 35.0 mm, voltage of 120 kV). Interpretation of acquired images were carefully reviewed, analyzed and interpreted by three (3) radiologists and discordant readings were dropped.

Results: All selected patients showed radiological manifestations of advanced stage and disseminated form of tuberculous infection by chest CT scan. The most predominant manifestation of hepatic tuberculosis (16 patients, 66.7%) was the multiple hepatic lesions (micronodular/miliary form or mixed type). Purely calcified nodules was present in 14 patients (58.5%) suggestive of healed TB. The macronodular form (solitary and more than 2 cm in diameter) was seen in 8 patients (33%) while 2 patients demonstrated a hypodense nodule with central calcification. Follow-up chest CT scans of the included patients showed interval resolution of chest and liver lesions and regression of signs and symptoms after taking anti-TB medications after 6-9 months.

Conclusion: CT scan imaging can clearly show features of hepatic tuberculosis in patients clinically diagnosed with pulmonary tuberculosis before and after treatment with anti-TB drugs. The Hepatic TB lesions noted in the CT scan images can present in various ways.
CORRELATING THE DEGREE OF ULNAR VARIANCE WITH THE PRESENCE OF TRIANGULAR FIBROCARTILAGE TEARS AND OTHER TRIANGULAR FIBROCARTILAGE PARAMETERS AS SEEN IN MRI STUDIES OF THE WRIST DONE IN CHONG HUA HOSPITAL

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ABSTRACT

Objectives: To determine if the degree of positive ulnar variance correlates with the presence of tears of the triangular fibrocartilage of the wrist, as well as to observe how ulnar variance affect other parameters of the triangular fibrocartilage, particularly triangular fibrocartilage thickness and triangular fibrocartilage angle.

Methodology: 50 MRI studies of the wrist with accompanying radiographs were reviewed from the Picture Archiving System (PACS) of a tertiary hospital. The results of the MRI studies were reviewed. GRE sequences were used to analyze for the presence of triangular fibrocartilage tears and to measure the triangular fibrocartilage angle and triangular fibrocartilage thickness. The ulnar variance was measured on the respective radiographs. Spearman rho correlation was used to determine the correlation between positive ulnar variance and the presence of triangular fibrocartilage tears. Cross-tabulation was then used to correlate the degree of positive variance with the presence of triangular fibrocartilage tears. Spearman rho was also used to determine the correlation between ulnar variance and triangular fibrocartilage angle and triangular fibrocartilage thickness

Results: There was significant correlation (p-value - .000) between positive ulnar variance and the presence of triangular fibrocartilage tears. Cross-tabulation also showed that there is higher incidence of triangular fibrocartilage tears in patients with higher degrees of positive ulnar variance. Significant correlation was also seen between ulnar variance and triangular fibrocartilage thickness and ulnar variance and triangular fibrocartilage angle. Both had a p-value of .000

Conclusion: The degree of positive ulnar variance does correlate with the presence of triangular fibrocartilage tears. Ulnar variance also affects the triangular fibrocartilage thickness and triangular fibrocartilage angle, in which the degree of positive ulnar variance has an indirect correlation with the triangular fibrocartilage thickness and a direct correlation with the triangular fibrocartilage angle.
MULTIMODALITY IMAGING IN THE EVALUATION OF PARASITIC TWINNING: A CASE REPORT

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*A full report of this case had been previously published online in the Asian and Oceanic Forum for Pediatric Radiology (AOfPR), the official online Forum of the Asian and Oceanic Society for Pediatric Radiology (AOSPR), on February 2016.

ABSTRACT

Parasitic twinning is an extremely rare anomaly that is estimated to occur just once in every 1 to 2 million live births. It represents an asymmetric form of conjoined twins, wherein one twin fails to undergo normal development in utero and becomes vestigial and completely dependent on the other. Because of its rarity and potentially complex anatomic issues, its management may be a challenge especially for surgeons. The role of radiologic imaging cannot be undermined in the assessment of such cases, especially for pre-operative planning. A case of pygopagus parasitic twins, with supernumerary limbs and other truncal and cranial anomalies, presented at our institution. Multimodality imaging workup, comprising of computed tomography, magnetic resonance imaging, contrast enema and angiographic studies, was performed. Structures from the parasite, including its limbs, dysmorphic pelvis, dysplastic brain and vestigial trunk, were delineated from those of the autosite. Issues on which lower extremities belonged to the autosite and which belonged to the parasite were resolved through examination of their skeletal and vascular anatomy. The presence of additional anomalies, such as callosal dysgenesis, arachnoid cyst, dermoid cyst and vertebral fusion defect, which otherwise cannot be identified through clinical examination alone, were also diagnosed.

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BRITTLE BONES

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ABSTRACT

Osteogenesis imperfecta (OI) is a rare inherited disorder of connective tissue with a broad spectrum of medical and genetic variability. The inherent diversity in majority of the cases, involves mutations in the type I collagen protein (COL1A1 and COL1A2). The progressive deforming type is OI type III. This is a case of a 43-year-old female who presented with diarrhea with an incidental note of severe dwarfism and body disproportion associated with impairment in mobility. Radiological examinations reveal generalized osteopenia, marked kyphoscoliosis of the spine, protrusio-acetabulae, multiple pathologic fractures, and long bone deformities, all of which are suggestive of OI type III. The atypical presentation of this condition in adulthood necessitates early diagnosis for prompt intervention. However, treatment for OI is not curative and focuses on improving the quality of a patient’s life.
LOCKED IN: A RARE CASE OF FIBRODYSPLASIA OSSIFICANS PROGRESSIVA

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ABSTRACT

Background: Fibrodysplasia ossificans progressiva is a hereditary disorder characterized by progressive ossification of striated muscles, tendon, ligaments, fasciae, aponeurosis, and occasionally skin. Bridges of extra bone develop across joints, progressively restricting movement and forming a second skeleton that imprisons the body in bone. Fibrodysplasia ossificans progressiva is a very rare disorder, occur in approximately 1 in 2 million people worldwide and with only several hundred cases reported. Most occur as a result of a sporadic new mutation, but may be inherited as autosomal dominant with a wide range of expression. The most common malformation associated with Fibrodysplasia ossificans progressiva is bilateral microdactyly of the first toes, often with synostosis of the phalanges. Natural history is that of erratic remissions and exacerbations with flare-ups occurring spontaneously or following bodily trauma.

Significance: Being a rare condition, the diagnosis has often been missed. The primary importance of this case is to attempt to raise awareness of the disease entity.

Case: 17 year old male who presented with bilateral hypoplastic hallux, multiple tender palpable soft-tissue masses, and severe movement restriction of the neck, spine and extremities. Diagnosis of fibrodysplasia ossificans progressiva was considered due to characteristic radiographic features of multifocal heterotrophic bone formation along with congenital stigmata of the extremities.

Conclusion: Plain radiographs provide characteristic findings, and radiologists may play a major role in diagnosing and preventing invasive procedures or further traumatic insults to the patient.

“A CLOUD ON THE HORIZON”: A CASE REPORT ON OPTIC PATHWAY GLIOMA OF ADULTHOOD

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ABSTRACT

This is a case of 70 year old male with dysphasia, inappropriate responses and progressive blurring of vision is presented. Ophthalmologic physical examination showed clouded right cornea with normal direct pupillary reflex in the left. Initial assessment was cerebrovascular infarct. Non-contrast cranial CT scan showed the following findings: a mixed-attenuation mass intimately related to the optic chiasm in the suprasellar region, slightly hyperdense masses in the left hippocampal region and left temporal lobe, and secondary obliteration of the medial portion of the left Sylvian fissure and local compression of the left cerebral peduncle. The contrast-enhanced axial CT images revealed slight enhancement of the suprasellar mass intimately related to the optic chiasm with better delineation of a fluid-attenuation cystic focus within the said suprasellar mass, as well as the previously reported hyperdense lesions in the left hippocampal and medial temporal lobes. The presence of optic pathway glioma with leptomeningeal involvement of the said regions was then primarily considered. The advent of modern neuroimaging studies particularly MR and CT, has proven invaluable in confirming the diagnosis of optic pathway gliomas of adulthood due to its characteristic imaging features. However, due to the extremely variable and unpredictable natural history and clinical course of the disease, it continues to pose a treatment challenge to clinicians.
NEONATE WITH MICROCOLON: A CHALLENGING DIFFERENTIAL DIAGNOSIS

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ABSTRACT

Background: Intestinal obstruction in the newborns poses serious complications affecting the quality of life. Obstruction in this period is most commonly congenital in etiology and is caused by luminal obstruction (atresia) occurring at any point of the gastrointestinal tract. The point of obstruction must be identified in order to have proper management.

Significance: This is to contribute to the timely diagnosis of neonatal intestinal obstruction wherein management would need radiological assessment and for patients to have better outcome.

Objective: To present a list of challenging differential diagnosis in a case of low intestinal obstruction in a 4 day old neonate female.

Setting: De La Salle University Medical Center, a tertiary hospital in Dasmarinas, Cavite.

Case: A 4-day old full term female infant with a birth weight of 2.4 kg was delivered by uncomplicated normal spontaneous delivery to an 18 year-old G1P1 (1001) mother, presented with failure of passage of meconium. A pertinent finding on examination was a distended abdomen with hypoactive bowel sounds. Radiographic studies were done revealing microcolon suggestive of low bowel obstruction. The patient was then operated on.

Conclusion: The diagnosis of low intestinal obstruction in neonates could be challenging at first. Systematic approach and analysis is almost imperative to have a narrowed preoperative diagnosis. In this case, analyzing the pattern of microcolon will greatly help in coming up with the correct and timely preoperative diagnosis and would yield a better outcome.

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A RARE CASE OF URINOMA FOLLOWING STATUS POST-HYSTERECTOMY IN A KNOWN CASE OF CERVICAL CARCINOMA

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ABSTRACT

This is a case of a 61 y/o female, Filipino, G3P3 (3003) diagnosed of cervical adenocarcinoma stage IB, status post radical hysterectomy with bilateral salpingooophorectomy, peritoneal fluid cytology and bilateral lymph node dissection noticed to have bipedal edema, difficulty of breathing and increasing abdominal girth after a month post-surgery. Whole abdomen ultrasound revealed gallbladder sludges, normal-sized kidneys with bilateral mild pelvicaliectasia, underfilled urinary bladder and massive ascites. CT urography showed poor function of both kidneys with bilateral hydronephrosis, probable large abdominopelvic mass likely urinoma and bilateral pleural effusion. The retrograde ureterogram
cystoscopy revealed pinkish mucosal bladder with no mass or lesion seen, erythematous ureteral orifices and displaced anteriorly with cut off of the dye in the distal 3rd of the left ureter. The exploratory laparotomy showed a large mass likely urinoma adherent to the peritoneum and pushing the bowels superiorly. The urinoma was drained and incised in which fluid collection was send to the histopathology and shows pseudocyst with chronic inflammation and granulation tissue. Urinoma is a rare complication after a posttraumatic surgery. Prompt diagnosis and correction of the underlying cause can prevent complications such as abscess formation and sepsis.

MATURE CYSTIC TERATOMA WITHIN THE PELVIS IN A 1 MONTH OLD MALE

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ABSTRACT

This is a case of a 2 month old male who sought due to anuria. Clinically, he had progressive decreased urine output started at 4th week of life with concomitant loose bowel movements, low-grade fever, decreased milk intake, abdominal distention and mass in the periumbilical area. The patient was initially managed as a case of acute gastroenteritis with signs of dehydration. Pertinent physical examination include distended abdomen with an abdominal girth of 41 cm, palpable mass over the suprapubic area, hypoactive bowel sounds and tight sphincteric tone with no palpable mass on rectal examination. The rest of the physical examination was unremarkable. Straight catheterization at the emergency room drained 150 cc of concentrated urine.

Scout film of the abdomen revealed a soft tissue density at the pelvic region, distended bowel loops with non-obstructive gas pattern and paucity of pre-sacral gas. The KUB sonography showed both kidneys were within normal limits in size for age, however demonstrating bilateral hydronephrosis and presence of an elongated hypoechoic structure posterinferior to the bladder with no sonographically demonstrable communication in between the said structures measuring 3.4 x 5.1 cm. Correlative evaluation with contrast-enhanced CT scan of the abdomen demonstrated the previously noted non-enhancing cystic structure compressing and antero-superiorly displacing the urinary bladder and the rectosigmoid colon. Patient eventually underwent complete resection of the tumor. Grossly, the lesion was solid, septated cystic structure with clear serous fluid, measuring 6 cm in its widest diameter. Histopathology of the excised mass revealed: tumor’s cyst wall composed of fibrocollagenous tissue lined by simple stratified squamous epithelium and ciliated pseudostratified columnar epithelium and with mucosal glands, skeletal muscle, mature adipose tissue, and mature neural tissue compatible with mature cystic teratoma.

Teratomas are tumors containing derivatives from the 3 germ cell layers. Patient would present with urinary symptoms, urinary retention, or constipation as what this patient had clinically. Although teratomas in the sacrococcygeal region occurs in 1 in 35,000-40,000 live births, it is the most common congenital tumor in neonates and occurs in females with a ratio of 4:1. This particular form of teratoma are thought to arise from an area under the coccyx called “Hensen’s node”. Usually teratomas occurring in male patients and that are primarily located internally would have have worse prognosis, however, histopathologic diagnosis for this case was a mature cystic form, hence better prognosis.
OVARIAN MATURE CYSTIC TERATOMA PRESENTING AS ACUTE ABDOMEN IN A PEDIATRIC PATIENT IN THE EMERGENCY DEPARTMENT

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ABSTRACT

Case: This is a case of a 9 year old female, admitted due to left lower quadrant pain. Pertinent physical examination findings include: a 12 x 8 cm. movable, firm, slightly tender mass at the left lower quadrant, extending to the ipsilateral hypogastric area with associated direct tenderness. Rectal examination revealed a 10 x 8 cm. non-movable, slightly tender mass at the left hypogastric area. The patient underwent diagnostic tests including flat pate of the abdomen, whole abdomen ultrasound and contrast-enhanced CT scan which all showed findings consistent with teratoma. Patient was scheduled and eventually underwent pelvic laparotomy with frozen section the following day which confirmed the diagnosis.

Discussion: Ovarian dermoid cyst and mature cystic ovarian teratoma are terms often used interchangeably to refer to the most common ovarian neoplasm. These slow-growing tumours contain elements from multiple germ cell layers and are best assessed with ultrasound. There is a wide spectrum of radiologic findings of teratomas. Pelvic tooth-like calcifications in an initial abdominal radiograph of a female patient who presents with acute abdomen in the emergency department should raise the suspicion of teratoma. Ultrasound may then be recommended to confirm the diagnosis. CT scan or MRI may also be done to further characterize the extent of the lesion. In addition, radiologic imaging is essential in differentiating dermoid cysts from other ovarian neoplasms.

Conclusion: A good correlation of the imaging findings with the clinical data of the patient will help clinch the diagnosis.

SMALL BOWEL INTUSSUSCEPTION SECONDARY TO PEUTZ-JEGHER POLYP

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ABSTRACT

Peutz-Jegher syndrome (PJS) is a rare, autosomal dominant disorder causing mucocutaneous pigmentation and gastrointestinal hamartomatous polyps. We present a case of a 5-year old female with progressive abdominal pain and bilious vomiting. Patient had characteristic hyperpigmented macules on the lips. CT scan revealed multiple polyps in the stomach and intussusception causing small bowel obstruction. Surgical interventions revealed the intussusception was caused by a lead point polyp in the jejunum, after which resection and anastomosis was done and the patient recovered. Histologic appearance of the gastric and jejunal polyps were consistent with Peutz-Jegher type polyps.
MULTIPLE COMPLICATIONS IN A POST-LIVER TRANSPLANT PATIENT: A RADIOLOGIC PERSPECTIVE

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ABSTRACT

Objectives: To describe the post-operative B-mode ultrasound, Doppler ultrasound, CT scan and MRI findings in a patient who developed multiple complications after liver transplantation surgery

Methodology: Study design is case report in a tertiary government institution setting

Case: A 37-year-old male underwent liver transplantation at a local tertiary government institution. A few hours after the procedure, patient was noted to be hypotensive with decreased hemoglobin count. Abdominal ultrasound was then requested, showing hematoma formation in the hepatorenal fossa. After the patient was stabilized, he underwent exploratory laparotomy, evacuation of hematoma and suturing of bleeder vessels. A total of 1.5 liters of hematoma was evacuated. Routine Doppler examination of the hepatic vessels was conducted daily. On the 4th post-transplant day, minimal subhepatic fluid accumulation was noted. Magnetic resonance cholangiopancreatography was done, showing pericoledochal fluid collection attributed to probable bile leak. On the 12th post-transplant day, patient underwent another exploratory laparotomy with reconstruction of common bile duct anastomosis. Increasing levels of liver enzymes were observed. On the 14th hospital day, the proper hepatic artery and its branches could not be appreciated on routine Doppler ultrasound. Thrombus formation was considered, and subsequently confirmed by CT angiography. Peripheral hypodensities suggestive of infarction were also seen within the hepatic parenchyma. The patient then underwent a fourth operation on the 16th post-transplant day: exploratory laparotomy, revision of hepatic artery anastomosis, and closure with intraperitoneal mesh. Patient was discharged improved on the 32nd hospital day.

Conclusion: Liver transplant surgery can give rise to many different complications. Timely diagnosis of these complications by radiologic imaging is critical in ensuring early intervention and better prognosis.

CASE REPORT: CAROLI DISEASE IN A 64 YEAR OLD MALE

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ABSTRACT

Caroli's disease is a rare disorder characterized by congenital non-obstructive gross dilatation of the segmental intrahepatic bile ducts. The disease affects men and women equally and usually, more than 80% of patients, present with symptoms before the age of 30 years. This case presents a 64-year-old jaundiced male with no other accompanying signs and symptoms and unremarkable past medical, social/personal and family history. Initially treated as congestive heart failure with hepatic decompensation with laboratory findings showing non-specific results. MRCP was done due to persistent jaundice revealing hepatic cirrhosis with dilated extensive irregular dilatation of intrahepatic bile ducts surrounding the portal vein and polycystic kidneys giving the diagnosis of Caroli’s Disease. This entity is usually discovered when the liver is imaged during investigation of suspected cholangitis. If the disease is localised, surgical intervention may be offered, however in diffuse disease, management is generally with conservative measures and liver transplantation may be an option.
IMAGING OF A PATIENT WITH PRIMARY PERITONEAL CARCINOMA: A CASE REPORT

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ABSTRACT

Background: Primary peritoneal carcinoma (PPC), or primary serous papillary carcinoma, is a rare primary neoplasm of the peritoneum occurring mostly on postmenopausal women. Treatment includes surgical debulking and chemotherapy. A 5-year survival rate of 15% was reported.

Case: A 48 year-old woman presented with hypogastric pain and gradual increase in abdominal girth. Abdominal radiograph revealed a soft tissue density in the pelvo-abdominal region. Ultrasound of the urinary tract showed an 11.1 x 9.3 cm complex mass in the left adnexa. Total Abdominal Hysterectomy with Bilateral Salpingo-oophorectomy was done and histopathologic study confirmed the diagnosis of poorly differentiated adenocarcinoma of the peritoneal mass. Patient underwent chemotherapy. Whole abdomen Magnetic Resonance (MR) imaging with contrast one year post-operatively revealed no evidence of tumor recurrence or metastasis and Diffusion-weighted MR imaging of the whole body 15 months post-operatively showed no evidence of abnormal restriction.

Conclusion: Imaging tests such as radiography, ultrasonography, computed tomography (CT), MR imaging and positron emission tomography (PET) are valuable in the diagnostic work-up of patients presenting with abdominal or pelvic mass. Early treatment initiation may be pursued after arriving at an accurate diagnosis.

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RADIOGRAPHIC CT FEATURES OF JUVENILE NASOPHARYNGEAL ANGIOFIBROMA: A CASE REPORT

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ABSTRACT

Juvenile Nasopharyngeal Angiofibroma (JNA) is a benign, locally growing highly vascular tumor. A 15 year old Filipino male with recurrent epistaxis, fullness and obstruction of the left nares was diagnosed with JNA. CT scan shows a mass obliterating the left pterygopalatine fossa invading the sphenoid bone and extending to the left nasal passage. The patient underwent embolization then surgery. One year post surgery, patient now complains of left facial swelling and blurring of vision. Repeat CT scan shows JNA recurrence in the pterygopalatine fossa with aggressive extension to adjacent structures through inferior orbital fissure, foramen rotundum, sphenopalatine fissure, pterygomaxillary fissure, vidian canal and greater and lesser palatine fissure.

Keywords: Juvenile Nasopharyngeal Angiofibroma (JNA), young male, recurrent epistaxis, CT scan, embolization, pterygopalatine fossa
ANTERIOR MEDIASTINAL MASS CONSISTENT WITH PRIMARY MEDIASTINAL LARGE B-CELL LYMPHOMA

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ABSTRACT

Background: For anterior mediastinal masses, the classic differential diagnoses were the 4 T’s, namely thymoma, thyroid, teratoma and terrible lymphoma. Mediastinal lymphomas are common, either as part of a disseminated disease or less commonly as the site of primary origin. Others include mediastinal tuberculosis.

Case: This is a case of 15 year old, male, Filipino who presented with progressive shortness of breath, decrease appetite, fatigue and fever. On initial consult and evaluation where chest radiograph was done, extensive PTB was the initial working diagnosis. Anti-TB medication was started, however, patient developed drug reaction and symptoms persisted. Re-evaluation chest radiograph showed massive left-sided pleural effusion and chest tube insertion was done. After transfer to another tertiary hospital, laboratory results done showed normal levels of PTH, T3, T4, TSH, HCG and AFP, non-detection of MTB Drug Resistance, elevated ESR and elevated lactate dehydrogenase. The follow-up chest x-ray revealed complete opacification of the left hemithorax with a deviation of the trachea and the heart to the right, chest sonogram showed minimal loculated pleural effusion and an extensive heterogeneous mass within the left chest cavity and thoracic and abdominal computed tomography with and without IV contrast demonstrated a 16 x 13 x 10 cm heterogeneous enhancing anterior mediastinal mass lesion without fat or calcifications with areas of necrosis, rightward displacement of the mediastinal structures and heart, compression atelectasis of the left lung, minimal pleural effusion on the left side and moderate pericardial effusion. CT-scan guided fine needle aspiration biopsy of the mass showed round cell proliferation which can be inflammation from TB, lymphoma or Germ Cell Tumor. Immunohistochemistry confirmed large B-Cell Lymphoma.

Conclusion: Primary mediastinal large B-cell lymphoma is a sub-type of diffuse large B-cell lymphoma derived from the thymus. Though imaging findings can be characteristic, histopathology and immunohistochemistry were necessary to distinguish these entities.

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STRAWBERRY THIGH: KASABACH- MERRITT SYNDROME

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ABSTRACT

Kasabach-Merritt Syndrome is a chronic consumption coagulopathy developing within the hemangioma. The pattern of coagulation abnormalities may range from a mild isolated thrombocytopenia to a severe depletion of clotting factors, leading to life-threatening hemorrhages. Treatment of this condition is not standardized. An overall mortality of 40-80% has been reported for visceral hemangiomias. This is a case of a patient with giant hemangioma with associated thrombocytopenia who undergone several diagnostic imaging studies such as magnetic resonance imaging, CT-angiogram, as
well as conventional angiography to facilitate in the diagnosis and management of Kasabach-Merritt Syndrome. Partial embolization of the hemangioma was performed through invasive radiology until vascular stasis was noted. Excision was recommended through surgical debulking to be followed by reconstructive surgery in the hope of permanent growth inhibition and complete resolution of the coagulopathy. Identification of vascular tumor with Kasabach-Merritt Syndrome is essential. Hence, good preoperative imaging studies of the tumor are the most useful tools for careful planning and could represent the key for the success of the intervention.

A CASE REPORT ON CORTICAL HYPERPLASIA

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ABSTRACT

Cushing syndrome results from an excess production of cortisol by the adrenal cortex resulting from a pituitary adenoma or an ectopic source. Dexamethasone suppression test aids in differentiating a pituitary from an ectopic source. CT and MRI are equally accurate in detecting adrenal adenomas resulting in hypercortisolism. Glucocorticoid excess leads to rapid bone loss by inhibition of osteoblast function, stimulation of bone resorption, increase urinary calcium, decrease in intestinal calcium absorption and hypogonadism. Radiographic examination reveals typical findings of osteoporosis.

This is a case of a 22 year old female with complaints of low back pain. MRI of the spine revealed mild compression fractures in some of the thoracic and lumbar vertebrae and subchondral bone edema. Thick subcutaneous fat on the posterior cervical area was also noted. The spine also showed decreased density on CT-scan indicative of osteopenia. The patient’s history also includes the presence of behavioral changes and progressive weight gain. Pertinent physical examination findings included a moon facie, buffalo hump, presence of abdominal striae, obesity and hypertension. Clinical impression was that of Cushing’s syndrome. Blood chemistry revealed elevated serum cortisol and ACTH levels. Hyperglycemia was also noted. A random cortisol was elevated. Both low dose and high dose dexamethasone suppression test (DST) failed to suppress cortisol level. Urine cortisol and plasma ACTH were all elevated. These indicated an ectopic source of ACTH production. Tumor markers were obtained in search for the possible ectopic source. Calcitonin and alpha fetoprotein were normal. However, CEA, CA-125 and CA 19-9 were elevated. MRI of the brain, bronchoscopy, endoscopy and colonoscopy were also done with no ectopic tumor identified. MRI of the upper abdomen showed that the adrenal glands are normal in size. There is however subtle nodularity of the left adrenal gland. CT-scan revealed similar findings. At some point in the patient’s clinical course, the patient had episodes of dyspnea, tachypnea and hypotension. A separate CT-scan on work-up for pulmonary embolism showed intense adrenal gland enhancement. CT-angiography of the pulmonary arteries did not reveal any pulmonary emboli. There is note of a moderate amount of right pleural effusion. Also noted was increased enhancement of the adrenal glands. This finding has been described in some literatures as part of the CT-hypoperfusion complex.

The patient eventually underwent a bilateral adrenalectomy as clinical findings strongly indicated Cushing’s syndrome secondary to an ectopic source. Histopathology revealed cortical hyperplasia, both adrenal glands.
A CASE REPORT ON IDIOPATHIC PULMONARY HEMOSIDEROSIS

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ABSTRACT

Idiopathic Pulmonary Hemosiderosis is an abnormal accumulation of hemosiderin in the lungs resulting from diffuse alveolar hemorrhage. Most patients manifest before 10 years old. The etiology and pathogenesis are unknown. Afflicted patients present with triad of iron-deficiency anemia, hemoptysis and alveolar infiltrates on chest x-ray. Early disease shows patchy air-space consolidations scattered in both lungs. Serial radiographs show replacement of the consolidation by a reticulonodular pattern whose distribution is identical to the air-space disease.

This is a case of a 13 year old female who came in with complaints of pallor and hemoptysis. She was diagnosed with iron deficiency anemia at 4 years old, given oral iron supplements with poor compliance and had multiple prior admissions due to anemia with multiple blood transfusions. The onset of cough and hemoptysis was at 7 years old. This was managed as a case of tuberculosis. One week prior to admission, patient complained of dyspnea on exertion. On the day of admission, there was hemoptysis, pallor and body malaise. Physical examination revealed the patient was pale and tachycardic. Blood work showed anemia, reticulocytosis, low serum iron and elevated serum ferritin levels. The series of chest x-rays reviewed showed progressive appearance of reticulonodular densities in both lungs. Contrast enhanced study of the chest done for further evaluation showed diffuse reticulonodular densities, scattered ground glass opacities and areas of interstitial thickening in both lungs suggestive of an interstitial lung disease. Hilar and mediastinal lymphadenopathy were also noted. Bronchoalveolar lavage done demonstrated no micro-organisms and was negative for acid fast bacilli (AFB). Lung tissue biopsy revealed mild chronic inflammation with several hemosiderin-laden macrophages noted. The final clinical impression given to the patient was Idiopathic Pulmonary Hemosiderosis.

THE MALE MEDUSA

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ABSTRACT

Arteriovenous Malformation (AVM) is rare with an incidence estimated at 1 in 100,000 population. Scalp AVM represents only 8% of all AVMs. Uncontrolled spontaneous hemorrhage is the most dreaded secondary complication, thus the need for prompt preventive and corrective measure.

This is a case of a 29-year old male with a humongous scalp AVM in the right temporoparietal region, extensively involving the whole of the scalp projecting the “medusa-like imagery”, probably the first case in an adult male. Web literature search yields negative result for similar cases. Computed Tomographic Angiography (CTA) and Magnetic Resonance Angiography (MRA) which are excellent non-invasive procedures used to evaluate AVMs and define the extent of the lesion in this case providing the road map for the proper surgical intervention. Conventional angiography and embolization showed dramatic result in reducing the size of the AVM and eliminating associated symptoms of headache and spontaneous bleeding episodes.
CASE REPORT: MECONIUM PERITONITIS

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ABSTRACT

Meconium peritonitis is a rare condition occurring in 1 in 35 pregnant women that leads to neonatal morbidity and mortality. It usually results from intrauterine gastrointestinal perforation. Management of cases like this is controversial and very difficult to perform; therefore immediate diagnosis through imaging plays a significant role. This is a cases of a kg boy who was born term to a 23 year old primigravid. Patient’s mother had premature rupture of membrane for 72 hours with regular contractions prompting consult to our institution. Antenatal ultrasound was performed prior to admission and delivery where calcifications were noted in the fetal abdomen. Increased abdominal girth was identified upon delivery, hence babygram was done which revealed intra-abdominal calcifications and ascites suggestive of meconium peritonitis. CT scan and sonography of the abdomen also showed ascites, pneumoperitoneum, scrotal and peritoneal calcifications consistent with meconium peritonitis. Emergency exploratory laparotomy was done where peritoneal lavage and application of drain were performed. Intraoperative findings confirmed the radiologic findings.

NEUROBLASTOMA

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ABSTRACT

Neuroblastoma is the most common extracranial solid tumor in children. The most common sites of origin of neuroblastic tumors are the adrenal region, extraadrenal retroperitoneum, and chest. Forty-eight percent of patients have metastatic disease at diagnosis. Distant metastases of neuroblastomas are located primarily in bone marrow or bone.

This is a case of RM, an 11 year old female, who came in due to a left knee mass. The patient reportedly had a history of trauma on the left knee. On physical examination, there was a firm, smooth, tender, non-movable mass in the left knee. On x-ray, a pathologic fracture was appreciated in the left distal femur with associated erosion and lytic changes, and periosteal uplifting. The impression for the x-ray study was suggestive of an aggressive infectious process versus a neoplasm. A magnetic resonance imaging on the left knee was subsequently done revealing an abnormal marrow signal in the distal femur with the presence of a large, expansile, multilobulated mass. Overall, the MRI findings were suggestive of a neoplastic process such as Ewing’s sarcoma or osteosarcoma, telangiectatic type. Patient underwent biopsy of the distal femoral mass with frozen section and immunohistochemical test with findings consistent with neuroblastoma.

The radiographic distinction of Ewing sarcoma from metastatic neuroblastoma may occasionally be difficult. Bone marrow involvement must be assessed by using both imaging and bilateral bone marrow aspirate and biopsy. The role of whole-body MR imaging in bone marrow assessment is still not defined in patients with neuroblastoma.

The radiographic distinction of Ewing sarcoma from metastatic neuroblastoma may occasionally be difficult. Bone marrow involvement must be assessed by using both imaging and bilateral bone marrow aspirate and biopsy. The role of whole-body MR imaging in bone marrow assessment is still not defined in patients with neuroblastoma.
“THE ROAD LESS TRAVELED”

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ABSTRACT

Uterine leiomyoma, leiomyomata, myoma or uterine fibroids are the most common gynecological tumor and present in 30% of women of reproductive age. On the other hand, intravenous leiomyomatosis (IVL) is another variant of myoma that are extremely rare with less than 200 reported cases since 1896 and only 1 reported in the Philippines. This condition is characterized by the growth of mature smooth muscle inside the lumen of uterine and pelvic veins, and rarely this would extend into inferior vena cava or even the heart.

This is a case of a 34 year old overseas Filipino worker, nulliparous with an incidental finding of painless abdominal mass. On CT imaging, the intraabdominal mass was noted to be continuous with the right internal iliac vein, right common iliac vein, inferior vena cava up to the right atrium and ventricle. Patient underwent two stage procedure for removal of the cardiac and pelvic masses. Histopathologic evaluation the right atrial and pelvic masses were consistent with leiomyoma.

ADULT INTUSSUSCEPTION: MULTIPLE ENTERO-ENTERIC INTUSSUSCEPTION SECONDARY TO MALIGNANT LYMPHOMA

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ABSTRACT

Intussusception of the bowel is defined as the telescoping of a proximal segment of the gastrointestinal tract within the lumen of the adjacent segment. This condition is frequent in children and presents with the classic triad of cramping abdominal pain, bloody diarrhea and a palpable tender mass. However, bowel intussusception in adults is considered a rare condition. Adult intussusception represents 5% of all cases of intussusception and accounts for only 1%-5% of intestinal obstructions in adults. The condition is distinct from pediatric intussusception in various aspects. In children, it is usually primary and benign, and pneumatic or hydrostatic (air contrast enemas) reduction of the intussusception is sufficient to treat the condition in 80% of the patients. In contrast, almost 90% of the cases of intussusception in adults are secondary to a pathologic condition that serves as a lead point. In general, most lead points in the enteroenteric intussusceptions are benign, including benign neoplasm, Meckel’s diverticula, adhesions, lymphoid hyperplasia and adenitis, trauma, celiac disease, duplications, and inflammatory lesions. About less than one-third of adult intussusception. In contrast to colo-colic intussusception which is likely malignant in etiology. Adenocarcinoma is the leading cause of adult large bowel intussusception but lymphoma has been reported. In 70 to 90% of adult cases of intussusception require definite treatment, of which surgical resection is, most often, the treatment of choice.

Malignant lymphoma is an uncommon cause of intussusception in adults and multiple intussusceptions due to malignant lymphoma are extremely rare. Our case is a 66 year old woman who presented with symptoms of vague, colicky abdominal pain and nausea whose CT-scan of the whole abdomen showed multiple lobulated heterogeneously enhancing intraluminal masses in the ileum producing multiple multiple points of entero-enteric intussusceptions. Ileal resection with jejuno-ileal anastomosis and biopsy was done. The pathology of the lead points turned out to be malignant lymphoma.
BRAVE HEART: CORONARY ARTERY FISTULA

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ABSTRACT

A coronary artery fistula is a rare anomaly that may cause angina, atrial fibrillation, endocarditis, aneurysmal dilatation and myocardial infarction. It has the incidence of less than 0.1%. Both spontaneous regression and life threatening complications have been described. Treatment can be conservative directed to address symptoms, corrective by surgery or minimally invasive by transcatheter closure.

This is to report a case of a 44 years old female who presented with progressive on and off palpitations and difficulty of breathing for over 13 years. The patient underwent Computed Tomography Angiogram (CTA) for which an anomalous left coronary artery fistula draining to the right atrium was identified. This patient underwent surgical repair of the left coronary artery-right atrium fistula under cardiopulmonary bypass and had uneventful recovery after treatment. Accurate imaging with high spatial and temporal resolutions are imperative in illustrating the anatomy of the left coronary artery fistula, which was crucial in the planning and interventional management of this patient.

CONGENITAL CYSTIC ADENOMATOID MALFORMATION (CCAM)

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ABSTRACT

This is a case of a 23-day old neonate who was observed to have 2-week history of a gradually worsening tachypnea and cyanosis especially after feeding. The initial chest x-ray revealed patchy densities in the right lung and was managed as a case of pneumonia. The repeat chest x-ray showed no significant changes compared to the previous film taken 4 days prior. The chest CT scan revealed multiple, thin-walled cystic spaces in the left lung and decreased volume of right lung with ground-glass opacities. The mediastinal structures are displaced to the right. The working diagnosis was pneumonia. The differential diagnoses of solitary or multiple cyst-like pulmonary lesions in a child are diaphragmatic hernia with bowel in chest, pneumatocele, sequestration and congenital cystic adenomatoid malformation (CCAM). Final Diagnosis was Acute Respiratory Failure, secondary to Pediatric Community-Acquired Pneumonia- Class D, High Risk, secondary to Congenital Cystic Adenomatoid Malformation.