



# RADIOLOGY JOURNAL

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## MESSAGE FROM THE RESEARCH COMMITTEE CHAIR

Greetings!

The Research Committee of the Philippine College of Radiology constantly seeks measures each year to improve the quality of researches produced by the residents and diplomates of the College; such as encouraging research proposals to be approved by the training institutions and with plans of the College to put up its own Ethics Review Board to help institutions without their own ERB. We, however, lack in experts in epidemiology and research to be able to put this dream into a reality. We hope to encourage our new graduates to take up Masteral courses in this avenue to help our residents/diplomates produce better papers each year.

The research papers submitted this year were markedly improved from the early years when the research proposals did not pass through the Research Ethics Review Board of their training institutions. I commend the training officers and their research coordinators for producing better quality researches with the aim of improving Radiology and Radiation Oncology practice.

Kudos also to the team members of the Research Committee for Diplomates who are the following Radiologists/Radiation Oncologists: Nonette A. Cupino, Ana Luisa Allosa, Maria Theresa T. Sanchez, Rowena Lyn P. Alabado, Anatole J. Garcia, Ronald J. de Castro, Michael Rico B. Mesina and Sagisag Dadap. The work of the Research Committee would not have been completed on time without their expertise and help in reviewing the 79 papers submitted in 2018-2019. Much appreciation also to Dr. Marc James DC Delos Santos, the sole research reviewer for the residents' research proposals and finished papers and the current Residency Training Council Head.

Congratulations to the 2019 PCR Oral and Poster Research Contest winners and presenters, as well as to the rest of the diplomates who labored to be able to complete their researches in time for the 2019 Annual Convention! We hope there will be more like you in 2020!

**Maria Lourdes Bernardo-Lacanilao, MD**  
**Research Committee Chair**



## MESSAGE FROM THE RESIDENCY TRAINING COUNCIL CHAIR

Greetings!

It has been said by Ben Bernanke that the most important reason is that research itself provides an important long-run perspective on the issues that we face on a day-to-day basis. We do research in our own institutions not only as a requirement for completion but moreover because we have a lot of questions on our mind that involves our daily practice of radiology that needs elucidation. These queries may be as simple as asking a normal set of values for Filipinos when it comes to different anatomical parts while you are reading a multiplanar imaging to something complex as compiling the gamut of imaging characteristics of diseases proven by a gold standard. It is in this never-ending pursuit that we thrive, learn and evolve.

I, together with all the training officers of the different training institutions in the country, would like to extend our utmost congratulations and appreciation for the trainees who participated in the annual research competition and annual interesting case competition of the Philippine College of Radiology. May this journal be a strong proof that our hunger for knowledge and our willingness to unearth the truth for the betterment of the society will always prevail.

Likewise I also congratulate all the trainees and candidates for fellowship under the PCR who have painstakingly spent numerous nights, who have toiled for numerous days, months or even years to come up with a sound answer to a lot of life's questions.

May this continuous search be a guiding torch that will light the path of the PCR for generations to come.

**James DC delos Santos, MD**  
**Residency Training Council Chair**



# An Evaluation of the Association between Rotator Cuff Abnormalities and Reduced Acromiohumeral Distance: A Retrospective Study on Adult Patients who Underwent Shoulder MRI at Makati Medical Center from January 1, 2017 to June 30, 2017

1st place, Philippine College of Radiology Research Contest, Oral Presentation

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## ABSTRACT

The primary objective of this study was to evaluate the association between rotator cuff abnormalities and reduced acromiohumeral distance. A retrospective review of the shoulder MRI studies of patients aged 30-65 years, who underwent MRI of the shoulder in Makati Medical Center from January 1, 2017 to June 30, 2017, was done. Three patient groups was formed and stratified according to their acromiohumeral distance. The shoulder MRI findings between the three groups were compared for the following findings: presence and location of tendinosis/partial tear, presence and location of complete tear, size of complete rotator cuff tear, degree of fatty muscle degeneration, and presence of muscle atrophy. The results of this study showed that a decreased acromiohumeral distance (i.e. <7 mm) was associated with full thickness rotator cuff tear and rotator cuff muscle degeneration. Even though superior tearing involving the supraspinatus tendon was the most common full thickness rotator cuff tearing, posterosuperior tearing was only seen in patients with acromiohumeral distance less than 7 mm, emphasizing the importance of the infraspinatus tendon/muscle in actively depressing the humeral head and maintaining normal acromiohumeral distance. No significant association, however, was seen between the presence of rotator cuff tendinosis/partial tears and reduced acromiohumeral distance. This further supports the multifactorial etiology of rotator cuff tendinopathy, wherein narrowing of the subacromial space is just one of the mechanisms causing rotator cuff tendinopathy.

## INTRODUCTION

Acromiohumeral distance (AHD) measures the space between the humeral head and the acromion. Mean AHD in the absence of rotator cuff tear is 10.5 mm, with a range of 6 to 14 mm according to Cotton and Rideout, or 7 to 13 mm according to Weiner and Macnab.<sup>7</sup>

Several mechanisms causing decreased acromiohumeral distance have been proposed and include increased deltoid pull, lack of stabilization by the rotator cuff due to rotator cuff tear, absence of torn tendon structures as space holder, muscular fatty degeneration and muscle atrophy.<sup>14</sup> However, the most common implicated cause is rotator cuff tear. The rotator cuff stabilizes the glenohumeral joint in different shoulder positions and adjusts the translations of the humeral head.<sup>10</sup> It is comprised of the following four muscles and tendons: supraspinatus, infraspinatus, teres minor and subscapularis.

A decreased acromiohumeral interval on anteroposterior (AP) radiographs, indicating superior humeral head migration, has been found to be the most reliable radiographic finding in a full thickness rotator cuff tear. In studies where plain conventional radiography was used, AHD reduction to less than 6 mm is generally agreed to be pathological and indicative of a supraspinatus tendon rupture and patients with an AHD of 7 mm or less, at rest, are likely to have multiple tendon tears or a large cuff tear. With magnetic resonance imaging (MRI) in close-bore magnet gantries, which only allow for the evaluation of small shoulder motion and humeral rotations in the supine position, evidence was found that the subacromial space of patients with shoulder impingement syndrome is significantly smaller than that in healthy persons.<sup>9</sup>

In assessment of muscular atrophy of the rotator cuff muscles, the Goutallier classification was used. This classification was originally described in shoulder CT but is now applicable and most commonly used in MRI. This classification

system compares the ratio of fat to muscle on sagittal oblique images: stage 0-1 is considered normal and has no (0) to trace (1) amounts of fat investing the muscle bellies. Stages 2-4 are considered pathologic: more muscle than fat (2); equal muscle to fat (3); more fat than muscle (4). Muscular atrophy was also indirectly measured using the "tangent sign" on the most lateral cut of the sagittal plane where the spine appears in contact with the scapula on the MRI. A healthy supraspinatus should cross a line drawn from the superior border of the coracoid process to the superior border of the scapular spine. This line is called the "tangent." Failure of the supraspinatus to cross the tangent is considered a "tangent sign".<sup>11</sup>

There are previous studies that have shown that narrowing of the acromiohumeral distance was associated with rotator cuff tendon tear or muscle degeneration. These studies made use of different imaging modalities that included conventional radiography, magnetic resonance imaging and MR arthrography. There are few studies, however, that determine the most important structural change causing the decrease in acromiohumeral distance, whether it is tendon involvement (supra versus infraspinatus), tear size, or muscle degeneration. One of the few such studies was conducted by Saupé et al in the Orthopedic University Hospital in Switzerland. Conventional shoulder radiographs and MRIs were used to measure the acromiohumeral distance while MR arthrography was used to assess for abnormalities in the rotator cuff. In the study by Saupé et al., the size of the rotator cuff tear and degree of fatty degeneration of the infraspinatus muscle were shown to have the most pronounced influence on acromiohumeral distance.<sup>14</sup>

Instead of MR arthrography however, plain MRI study of the shoulder was used to assess the rotator cuff in this study. The use of magnetic resonance imaging (MRI) for estimating the ascension of the humeral head is currently under great discussion. One of the main issues involved is the fact that MRI is

performed in dorsal decubitus. It is believed that the reduction of the force of gravity on the limb during the examination might overestimate this radiological finding. In a study conducted by Franca, et al in 2016, MRI was used to demonstrate the relationship between the size, degree of retraction and topography of rotator cuff injuries and the degree of rise of the humeral head. They concluded that the rise of the humeral head was directly related to the size, degree of retraction and topography of the rotator cuff injuries, with greater degrees of rise in cases of superior and posterior lesions and anteroposterior-superior (massive) lesions. Furthermore, they also concluded that the assessment using MRI was not influenced by the force of gravity.<sup>4</sup>

## OBJECTIVES

The primary objective of this study was to evaluate the association between rotator cuff abnormalities and reduced acromiohumeral distance.

The specific objectives of this study included evaluation of the association between reduced acromiohumeral distance and the following: (1) presence and location of tendinosis or partial rotator cuff tear, (2) presence and location of full-thickness rotator cuff tear, (3) rotator cuff tear size, (4) muscular fatty degeneration, and (5) supraspinatus muscle atrophy.

## METHODOLOGY

### Research Design/ Data Collection

This was a retrospective review of the shoulder MRI studies of patients aged 30-65 years who underwent MRI of the shoulder in Makati Medical Center from January 1, 2017 to June 30, 2017. Both males and females aged 30-65 years were included in this study. Exclusion criteria included patients with previous history of fracture, shoulder surgery or rotator cuff repair, other underlying diseases such as tumor and glenohumeral osteoarthritis, as well as those with MRI imaging examinations inappropriate for analysis due to artifacts.

Three patient groups were formed and stratified according to their acromiohumeral distance measured on the sagittal MRI (non-fat saturated T2W sequence). Group 1 were patients with acromiohumeral distance measuring equal to or less than 7 mm, Group 2 included those measuring more than 7 to less than 10 mm, and Group 3 included those measuring equal to or more than 10 mm.

### Sample Size Calculation

Sample size was calculated based on a previous similar study by Saupé, et al. showing the prevalence of rotator cuff abnormalities in the shoulder MRI of adult patients with shoulder complaints.<sup>(10)</sup> Due to the fact that we dealt with qualitative variables and determination of the association of decreased acromiohumeral distance with rotator cuff injuries and based on a previous similar study by Saupé, et al., the expected proportions in the case group (patients with rotator cuff injuries and decreased acromiohumeral distance, i.e. less than or equal to 7 mm) and control group (patients with acromiohumeral

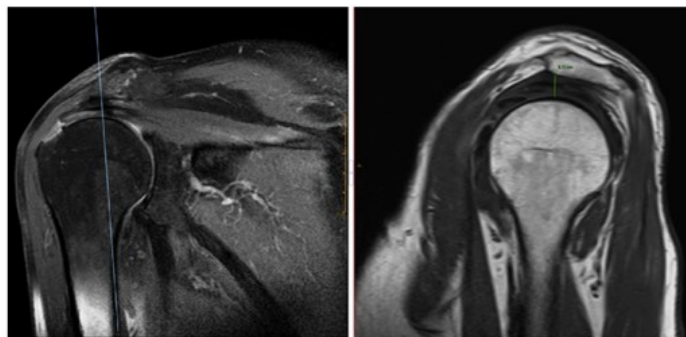
distance >7 mm) are 0.90 and 0.57, respectively - the sample size per group was computed at 31 cases per group.

### Imaging Protocol

All MRI images of the shoulder were done using a 1.5 Tesla MRI machine (MRI Aera) with the supine patient's shoulder placed in neutral position.

### Measurement of Acromiohumeral Distance

An experienced CT-MRI radiologist with more than 7 years of experience measured the acromiohumeral distance on the sagittal MRI (non fat-saturated T2W sequence). Acromiohumeral distance was measured electronically with a PACS workstation. Measurement was performed from the cortical bone at the inferior aspect of the acromion to the subchondral lamina of the humeral head. The measurement recorded was used for classification of the three patient groups, as stated previously.



**Figure 1.** Apex of the humeral head, seen on a coronal slice (image on left). Measurement of the shortest distance between the apex of the humeral head and the acromion, seen on a sagittal slice (image on right). Image source: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0102-36162016000200169](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-36162016000200169)

### Review of the Shoulder MRI Findings

MRI shoulder images were analyzed by at least two experienced CT-MRI radiologists, both with more than 7 years of experience, without knowledge of the radiographic acromiohumeral distance measurements. Both reviewers analyzed the shoulder MR images for presence and location of tendinosis/partial tear, presence and location of complete tear, size of complete rotator cuff tear, degree of fatty muscle degeneration, and presence of muscle atrophy. In the event that the two reviewers disagreed significantly, a third reviewer evaluated the findings to arrive at a consensus.

### Measurement of Rotator Cuff Tear

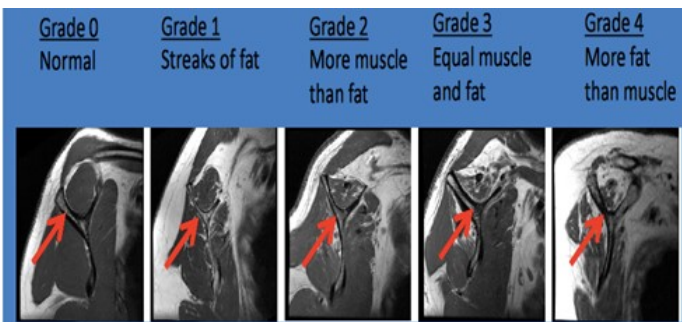
The coronal extent of the tear was measured from the insertion site at the greater tuberosity to the end of the tendon (for supraspinatus and infraspinatus tears) and from the insertion site at the lesser tuberosity to the end of the tendon (for subscapularis tears). The sagittal extent of the tear was measured at the site with the largest defect. The larger size between the coronal and sagittal extent of the tear measured in centimeters was recorded. Tears measuring 1 to less than 3 cm were coded as 1 (small), tears measuring 3 to less than 5 cm were coded as 2 (medium), and tears measuring greater than 5 cm were coded as 3 (large).

### Location of the Rotator Cuff Tear

The location of the rotator cuff tears were determined and classified according to the following locations: superior, anterosuperior, posterosuperior and anteroposterosuperior.

### Grading of Muscular Fatty Degeneration

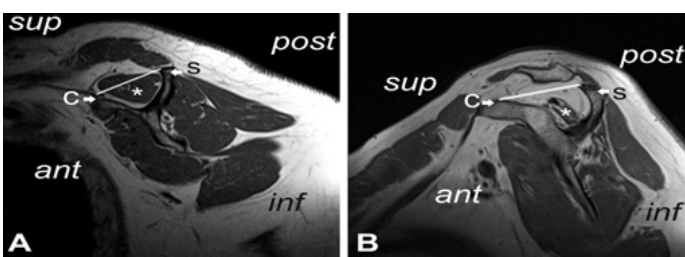
Grading of muscular fatty degeneration was graded according to the classification by Goutallier et al. using T2W non-fat saturated sagittal images. Stage 0 indicated no fatty degeneration; stage 1 some fatty streaks; stage 2 less fat than muscle; stage 3 as much fat as muscle; and stage 4 more fat than muscle. For fatty degeneration that was different in the superior and inferior parts of the subscapularis and infraspinatus muscles, the area with the highest stage was used for classification.



**Figure 2.** Goutallier Classification of Muscle Atrophy. Image source: [https://s3.amazonaws.com/classconnection/183/flashcards/3929183/png/goutallier\\_classification-156E8D6AFC840784E81.png](https://s3.amazonaws.com/classconnection/183/flashcards/3929183/png/goutallier_classification-156E8D6AFC840784E81.png)

### Assessment of Supraspinatus Muscle Atrophy

Muscle atrophy of the supraspinatus muscle was evaluated semi-quantitatively with the tangent sign. A line was drawn through the superior border of the scapular spine and the superior margin of the coracoid. The tangent sign was considered present when the supraspinatus muscle did not cross the



tangent. Presence of the tangent sign indicated supraspinatus atrophy.

**Figure 3.** Use of the Tangent Sign for Assessment of supraspinatus atrophy. Figure A illustrates a negative tangent sign. Figure B, on the other hand, shows a positive tangent sign wherein there is absence of the supraspinatus muscle above the line drawn between the superior border of the coracoid and scapular spine. Image source: <http://ajpcell.physiology.org/content/ajpcell/309/6/C383/F1.large.jpg>

### Data Collection and Recording

All patient medical record data (i.e. age and sex) and shoulder MRI images were extracted using the Makati Medical Center system (RIS/PACS). Patient data extracted, as well as

the measurements of the acromiohumeral distances and assessment of the rotator cuff abnormalities, were written in a standard data collection form.

### STATISTICAL ANALYSIS

Descriptive statistics was used to summarize the clinical characteristics of the patients. Frequency and proportion was used for nominal variables, and mean and SD or median and IQR (whichever was applicable) for interval/ratio variables. Difference between groups was determined by performing Chi-Square Test or Fischer's Exact Test for qualitative variables and Independent Sample T-test or Wilcoxon Rank sum test for quantitative variables. Association between tear size and acromiohumeral distance was determined with the Spearman's Correlation. P-values that were less than 0.05 level of significance were considered significant. All valid data were analyzed with STATA 15.0.

### ETHICAL CONSIDERATIONS

This study was conducted in accordance to the ethical principles based on the Declaration of Helsinki and the National Guidelines for Biomedical Research of the National Ethics Committee (NEC) of the Philippines. The research proposal underwent approval from the Institutional Review Board (IRB).

The data was recorded only in writing and was not recorded via video nor audio. Collected data was kept strictly confidential by the primary investigator. The data was stored in the primary investigator's password-protected database.

### LEVEL OF RISK

Since this study retrospectively studied the results of the shoulder MRIs of adult patients, minimal risk was involved. Magnetic resonance imaging or MRI also did not contain harmful x-rays nor ionizing radiation.

### RESULTS

The study population consisted of a total of 108 patients (54 women, 54 men; mean age of 48.1 years; age range: 30-65 years, stratified into three groups according to their acromiohumeral distance (AHD) as seen in Table 1. Each group contained an equal number of 36 patients each. No statistically significant difference in the mean age of males and females was seen between the three groups (p-value = 0.1744).

**Table 1.** Age-Sex Distribution.

Group No.	Males	Females	Total
	1	19	17
2	15	21	36
3	20	16	36
TOTAL	54	54	108

### Legend:

Group 1 - AHD < 7 mm. Group 2 - patients with AHD  $\geq$  7 mm to < 10 mm. Group 3 - patients with AHD  $\geq$  10 mm.

*Association Between Rotator Cuff Tendinosis and Reduced Acromiohumeral Distance*

The presence and the location of rotator cuff tendinosis per group was compared and tabulated as seen in Table 2 below. There was no sufficient evidence to conclude that there is a statistically significant difference in the presence of SSP, ISP and SSC tendinosis between the three groups.

**Table 2.** Number of Rotator Cuff Tendinosis

Group No.	Presence of Tendinosis		
	SSP	ISP	SSC
1	35 (97)	23 (64)	25 (69)
2	36 (100)	21 (58)	15 (42)
3	33 (92)	16 (44)	19 (53)

Note: Data are numbers of lesions; data in parentheses are percentages.  
Legend: SSP - supraspinatus muscle, ISP – infraspinatus muscle, SSC – subscapularis muscle.

*Association Between Rotator Cuff Partial Tear and Reduced Acromiohumeral Distance*

As seen in table 3 below, there was also no sufficient evidence seen to conclude that there is a statistically significant difference in the presence of SSP, ISP and SSC partial tears between the three groups.

**Table 3.** Number of Rotator Cuff Partial Tear

Group No.	Presence of Partial Tear		
	SSP	ISP	SSC
1	15 (42)	4 (11)	9 (25)
2	16 (44)	3 (8)	5 (14)
3	14 (39)	3 (8)	9 (25)

Note: Data are numbers of lesions; data in parentheses are percentages.

*Association Between Full Thickness Tears of the Rotator Cuff and Reduced Acromiohumeral Distance*

Table 4 below showed the association of the presence and location of full thickness rotator cuff tears with acromiohumeral distance. In group 1, full thickness supraspinatus tendon tears was present in 30.5% (11/36) of the patients, infraspinatus tendon tears in 11% (4/36) of the patients and subscapularis tendon tears in 5.5% (2/36) of the patients. Groups 2 and 3 had a lower prevalence of full thickness tears than group 1. There was a statistically significant difference in the presence of SSP and ISP full thickness tear between the three groups but not for SSC full thickness tears. However, results also showed that one patient in groups 1 and 2 had an intact rotator cuff without tearing of any tendons.

**Table 4.** Number of Full Thickness Tears of Rotator Cuff Tendons

Group No.	Presence of Full Thickness Tear		
	SSP	ISP	SSC
1	11 (30.5)	4 (11)	2 (5.5)
2	6 (16.7)	0	0
3	1 (2.8)	0	0
TOTAL	18	4	2

Note: Data are numbers of lesions; data in parentheses are percentages.

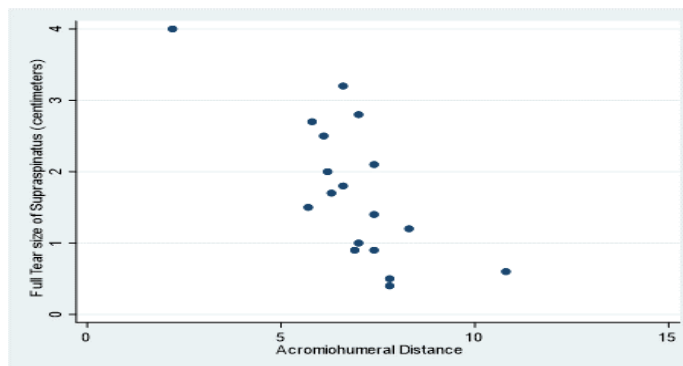
*Association Between Tear Size and Acromiohumeral Distance*

The size of the tears in the rotator cuff tendons varied from 0.9 to 4 cm (mean, 2.2 cm) in group 1, from 0.4 to 2.1 cm (mean, 1.08 cm) in group 2, and 0.6 cm in group 3. Statistically significant difference was seen in the median full thickness tear between group 1 and group 2. Group 3 was not included since there was only 1 observation.

**Table 5.** Mean Full Thickness Tear Size of the Supraspinatus Tendon

Group No.	Mean Full Thickness Tear Size (cm)
	2.2
1	1.08
2	0.6

Furthermore, sufficient evidence was seen to conclude that tear size is significantly correlated to acromiohumeral distance. In addition, the Spearman’s rho of -0.6943 showed that there was a moderate negative linear relationship between tear size and acromiohumeral distance.



**Figure 1.** Relationship of Tear Size with Acromiohumeral Distance

*Association Between Full Thickness Tear Location and Reduced Acromiohumeral Distance*

Location of full thickness rotator cuff tears was also documented in this study as seen below in Table 6. The tears were classified as anterosuperiorly located when it involved both the subscapularis and supraspinatus tendons, superiorly located when it involved solely the supraspinatus tendon, posterosuperiorly located when it involved the infraspinatus and supraspinatus tendons and anteroposterosuperiorly located when it involved the subscapularis, supraspinatus and infraspinatus tendons.

**Table 6.** Location of Full Thickness Tears

Group No.	Location of Full Thickness Tear			
	Antero superior	Superior	Posterosuperior	Anteroposterosuperior
1	1 (9)	6 (54)	3 (27)	1 (9)
2	0	6 (100)	0	0
3	0	1 (100)	0	0

Note: Data are numbers of lesions; data in parentheses are percentages.

Superior full thickness rotator cuff tear was seen to be the most common location of tear in all three groups, which comprised of 54% in Group 1 and was the only location of tearing seen in patients with acromiohumeral distance >7 mm. Posterosuperior tearing was seen to be the next most common location and was found only in patients with acromiohumeral distance <7 mm.

*Association Between Muscular Fatty Degeneration and Reduced Acromiohumeral Distance*

As seen in Table 7, substantial fatty degeneration (Goutallier stages 2-4) of the rotator cuff muscles was seen in thirteen patients in group 1, three patients in group 2, and none of the patients in group 3. There was significant difference in the number of substantial muscle atrophy (Grade 2-4) between the three groups.

**Table 7.** Number of Cases of Fatty Muscle Degeneration with Presence of “Tangent Sign”

Group No.	Muscle Degeneration Grade		“Tangent Sign” Present
	0 to 1	2 to 4	
1	23 (64)	13 (36)	9 (25)
2	33 (92)	3 (8)	1 (2.8)
3	36 (100)	0	0

Note: Data are numbers of lesions; data in parentheses are percentages.

Nine (25%) of the patients in group 1, one (2.8%) of the patients in group 2, and none of the patients in group 3 had supraspinatus atrophy with the presence of a tangent sign. There was statistically significant difference in the presence of the tangent Sign (i.e. supraspinatus atrophy) between the three groups.

**DISCUSSION**

Rotator cuff tendinopathy have been classically described as extrinsic, intrinsic or a combination of both. Extrinsic factors was defined as those causing compression of the rotator cuff tendons, while intrinsic mechanisms were those associated with degeneration of the rotator cuff tendons.

One of the extrinsic mechanisms to the etiology of rotator cuff tendinopathy included compression of the rotator cuff tendons and associated tissues within the subacromial space under the anterior aspect of the acromion or surrounding structures termed as the “subacromial impingement syndrome”. The subacromial space is the interval between the coracoacro-

mial arch, anterior acromion and the humeral head. The acromiohumeral distance, a linear measure between the acromion and the humeral head, was used to quantify the subacromial space.

This study aimed to determine the association of decreased AHD with rotator cuff tendinosis and partial tears. However, no sufficient evidence was seen to conclude that there is a statistically significant difference in the presence of rotator cuff tendinosis and partial tears between the three groups classified according to AHD. This finding is similar to the results of previous studies wherein patients with rotator cuff tendinopathy did not consistently present with significant deficits in subacromial space narrowing with the arm at rest (Azzoni and Cabitza, 2004; Desmeules et al., 2004). However, measurements of subacromial space taken with muscle activation were found to be useful to detect deficits related to biomechanical factors that “functionally” narrow the subacromial space (Graichen et al., 1999). In a series of MRI studies, acromiohumeral distance during active arm elevation was seen to be smaller in subjects with rotator cuff tendinopathy compared to healthy shoulders (Graichen et al., 1999; Hebert et al., 2003). This further supports the multifactorial etiology of rotator cuff tendinopathy, wherein the extrinsic mechanism of subacromial compression is just one of the many factors involved in causing tendinopathy.

The distance between the humerus and acromion has been used by shoulder surgeons to estimate the success of a rotator cuff repair. In the literature, an acromiohumeral distance <7 mm is considered a negative factor for rotator cuff repair, thus indicating non-amenability to suture repair. Unfavorable outcome in patients with a small acromiohumeral distance can be explained by the association of a short distance with a large rotator cuff tear and fatty degeneration of the infraspinatus and supraspinatus muscles. Weiner and Macnab in 1970 were the first to describe the association between reduction of the subacromial space and rotator cuff injuries. Their results showed that if the distance was <7 mm on conventional radiographs, a complete tendon tear would be present. Therefore, <7 mm is the cut-off value for abnormal acromiohumeral distance.

The results of this study show that a reduced acromiohumeral distance is a reliable sign of the presence of full thickness rotator cuff tears. Patients with acromiohumeral distance of less than 7 mm had the highest percentage of supraspinatus and infraspinatus tendon tears (30.5% and 11%, respectively). The number of full thickness tears of the supraspinatus and infraspinatus tendons decreased considerably with an increase in acromiohumeral distance (> 10 mm). This is compatible with results of other previous studies such as that conducted by Saupé et al. However, in the previous study done by Saupé et al. the measurement of acromiohumeral distance and assessment of the results was done using MR arthrography. Our results showed a higher percentage of tears (i.e. more than 90% of patients with a AHD of <7 mm having a full-thickness tear of the supraspinatus tendon and 67% having a full thickness tear of the infraspinatus tendon).

However, compared with previous results showing an AHD <7 mm was absolute proof of full thickness rotator cuff tearing, we had few exceptions. One patient each in groups 1 and 2 had intact rotator cuffs with no evidence of tear. In addition, an acromiohumeral distance of > 7 mm may also be associated with rotator cuff tears. In group 2 (acromiohumeral distance, >7-10 mm), tear size of up to 1.4 cm was seen while in group 3, one patient had a tear size of 0.6 cm.

Superior full thickness rotator cuff tearing was seen to be the most common location of tear in all three groups, which is compatible with results of previous studies. Posterosuperior tearing involving both supraspinatus and infraspinatus tendons was the next most common location. It was seen only in Group 1 wherein the acromiohumeral distance was less than 7 mm. This finding is also compatible with the results of other studies (Franca et al, 2016) wherein the subacromial space was smaller in patients with injuries in the posterosuperior and anteroposterosuperior regions, thus showing the importance of the tendon of the infraspinatus in maintaining the subacromial space. Saupé et al. also concluded that involvement of the infraspinatus tendon caused greater variation in the subacromial space.

The results also showed that reduced acromiohumeral distance was associated with atrophy and fatty degeneration of the rotator cuff muscles. Thirty six percent of patients in Group 1 showed substantial muscle atrophy with 25% exhibiting a positive tangent sign while none of the patients in Group 3 showed evidence of such. The correlation between reduced AHD and fatty degeneration of the rotator cuff muscles was less pronounced as previously shown by a CT arthrogram study by Nove-Josserand et al., wherein a 100 percent incidence of AHD distance narrowing was seen when the infraspinatus muscle was degenerated/atrophied.

Although this study showed a reduced acromiohumeral distance having a negative linear relationship with the presence of full thickness rotator cuff tear, the presence of outliers/exceptions (i.e. patients in Groups 1 and 2 having intact rotator cuff tendons) showed that the even though the acromiohumeral distance is a reliable sign of full-thickness rotator cuff tearing, it cannot, however, be used as a single criterion for surgical decision making in rotator cuff repair.

## CONCLUSION

The results of this study showed that a decreased acromiohumeral distance (i.e. <7 mm) is associated with full thickness rotator cuff tear and rotator cuff muscle degeneration. Even though superior tearing involving the supraspinatus tendon is the most common full thickness rotator cuff tearing, posterosuperior tearing was only seen in patients with acromiohumeral distance less than 7 mm, emphasizing the importance of the infraspinatus tendon/muscle in actively depressing the humeral head and maintaining normal acromiohumeral distance. No significant association, however, was seen between the presence of rotator cuff tendinosis/partial tears and reduced acromiohumeral distance. This further supports the multifactorial etiology of rotator cuff tendinopathy, wherein narrowing of

the subacromial space is just one of the mechanisms causing rotator cuff tendinopathy.

## RECOMMENDATIONS

This study utilized MRI images for the assessment of rotator cuff tendinosis, tears and muscle degeneration. Correlation of the findings with MRI arthrography and/or surgical findings may be done to increase the level of accuracy, especially for studying the correlation with full thickness tears. Further research to examine the changes in subacromial space with active arm elevation in patients with rotator cuff tendinopathy may also be undertaken since no correlation between reduced acromiohumeral distance and partial tears was seen in this study wherein the shoulders were examined at rest.

## REFERENCES

1. Azzoni, R., Cabitza, P., 2004. Sonographic versus radiographic measurement of the subacromial space width. *Chir. Organi Mov.* 89, 143–150.
2. Deniz, G, et al. Fatty degeneration and atrophy of the rotator cuff muscles after arthroscopic repair: does it improve, halt or deteriorate?. *Arch Orthop Trauma Surg.* 2014;134 (7): 985-90.
3. Desmeules, F., Minville, L., Riederer, B., Cote, C.H., Fremont, P., 2004. Acromio-humeral distance variation measured by ultrasonography and its association with the outcome of rehabilitation for shoulder impingement syndrome. *Clin. J. Sport Med.* 14, 197–205.
4. Franca, F. et al. Evaluation of the acromiohumeral distance by means of magnetic resonance imaging umerus. *Revista Brasileira de Ortopedia.* vol.51 no.2 São Paulo Mar./Apr. 2016.
5. Fuchs, B, et al. Fatty degeneration of the muscles of the rotator cuff: assessment by computed tomography versus magnetic resonance imaging. *Journal of Shoulder and Elbow Surgery.* 2000;8 (6): 599-605.
6. Goutallier, D, et al. Fatty muscle degeneration in cuff ruptures. Pre- and postoperative evaluation by CT scan. *Journal of Clinical and Orthopedics and Related Research.* 1994; (304): 78-83.
7. Goutallier, D. et al. Acromiohumeral distance less than six millimeter: Its meaning in full-thickness rotator cuff tear. *Journal of Orthopaedics & Traumatology: Surgery & Research* Volume 97, Issue 3. May 2011. Pages 246-251.
8. Graichen, H., Bonel, H., Stammberger, T., Haubner, M., Rohrer, H., Englmeier, K.H., et al., 1999. Three-dimensional analysis of the width of the subacromial space in healthy subjects and patients with impingement syndrome. *AJR Am. J. Roentgenol.* 172, 1081–1086.
9. Hébert, L. PhD, PT et al., Acromiohumeral distance in a seated position in persons with impingement syndrome. *Journal of Magnetic Resonance Imaging.* Volume 18, Issue 1. July 2003, Pages 72–79.
10. Kim, H., MS, PT, et al. Comparative Analysis of Acromiohumeral Distances According to the Locations of the Arms and Humeral Rotation. *Journal of Physical Therapy Science.* 2014 Jan; 26(1): 97–100.
11. Melis, B., MD et al. Natural History of Fatty Infiltration and Atrophy of the Supraspinatus Muof Clinical Orthopedics and Related Research. 2010 Jun; 468 (6): 1498–1505. scle in Rotator Cuff Tears. *Journal*
12. Nove-Josserand, L. et al. 1996. The Acromiohumeral Interval. A Study of the factors influencing its height. *Rev Chir Orthop Reparatrice Appar Mot,* 82 (5):379-85.
13. Rulewicz, G., MD et al. Supraspinatus atrophy as a predictor of rotator cuff tear size: an MRI study utilizing the tangent sign. *Journal of Shoulder and Elbow Surgery* (2013) 22, e6-e10
14. Saupé, N., et al. Association Between Rotator Cuff Abnormalities and Reduced Acromiohumeral Distance. *American Journal of Radiology* (2006) 187:376–382.
15. Seitz, A. L. et al. Mechanisms of rotator cuff tendinopathy: Intrinsic, extrinsic, or both?. *Clinical Biomechanics* 26 (2011) 1–12.
16. Somerson, J., M.D. Classifications in Brief: Goutallier Classification of Fatty Infiltration of the Rotator Cuff Musculature. *Clinical Orthopedics and Related Research* (2016). 474:1328-1332.

# The Immunomodulating Effects of Arabinoxylan Rice Bran (Lentin) on Hematologic Profile, Nutritional Status and Quality of Life among Head and Neck Carcinoma Patients Undergoing Radiation Therapy: A Double Blind Randomized Control Trial

2nd place, Philippine College of Radiology Research Contest, Oral Presentation

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## ABSTRACT

Immunostimulants have been explored to reduce the complications of radiation/chemotherapy. This double blind randomized trial aimed to determine the immunomodulating effects of Lentin among head and neck cancer patients in addressing radiation treatment complications such as anemia, leukopenia, weight loss and improvement of quality of life. Sixty-five (65) patients were enrolled and given either Lentin or placebo - 2 weeks prior, during radiation/chemoradiotherapy and 2 months after. Complete Blood Count, Body Mass Index, percent weight loss and EORTC Quality of Life questionnaires QLQ H&N35 were used to assess the degree of anemia, weight loss and quality of life. Overall CBC results revealed higher values on all parameters in Lentin arm. Upon completion of radiochemotherapy, the Lentin arm showed significantly higher mean hemoglobin by 1.30 g/dL ( $p=0.010$ ), hematocrit ( $p=0.001$ ), RBC ( $p=0.001$ ) and platelets ( $p=0.017$ ). Also, higher overall BMI (22.69 versus 21.52) and a lower percent weight loss (6.10% versus 6.91%) for Lentin compared to placebo were noted with  $p$ -values of 0.199 and 0.571, respectively. Treatment related toxicity using the RTOG grading showed lower severity scores on all parameters ( $p$ -values:  $>0.05$ ) and better QoL scores for patients taking Lentin ( $p$ -value: 0.019). Results from this study showed better clinical outcomes for patients taking Lentin. These have led to fewer blood transfusions, treatment delays and hospital admissions, avoidance of treatment mortalities and morbidities, and improved quality of life among head and neck cancer patients undergoing chemoradiotherapy.

## INTRODUCTION

Prognostic factors such as anemia and decreasing body mass index correlate well with treatment outcomes in Head and Neck cancer patients undergoing radiochemotherapy<sup>1,2</sup>. Hemoglobin level of less than 12 g/dl during multimodality cancer therapy are associated with decreased local tumor control and survival most often accompanied by decreasing leukocyte counts increasing susceptibility to infection and affecting the quality of life<sup>3-8</sup>. Blood transfusion and diet are the most common practice to improve hemoglobin status and body mass index. However, in our local setting where blood products are scarce and restoring body mass index through proper diet seems to take time, physicians resorted to dietary supplements that would help improve the immune system and combat the common adverse effects of radiochemotherapy that would cause treatment interruptions. However, this custom is not widely practiced due to lack of available data supporting its use.

Arabinoxylan rice bran also known locally as Lentin is a natural blend of hemicellulose product of rice bran that was partially hydrolyzed using shiitake mushroom enzymes (*Lentinus edodes mycelia* extract) wherein the principal ingredient is the arabinoxylan compound or  $\beta$ -1,4 xylophyronase hemicellulose<sup>9</sup>. The immunomodulatory mechanism and anti-tumor activity has been attributed to its complex structure of heteropolysaccharide (arabinogalactan, arabinoxylan, arabinan,  $\beta$ -1,3:1,4- glucan)<sup>10</sup>. As of this writing, only few articles have been published on the effects of Arabinoxylan rice bran (Lentin) among patients undergoing chemotherapy and lesser for patients undergoing both chemotherapy concurrent with radiotherapy (RT)<sup>11-16</sup>.

This study, aimed to determine the effects of the immunomodulating capacity of Arabinoxylan rice bran on hematologic profile more focus on the degree of anemia and leuko-

penia, nutritional status as reflected by weight loss and differences in Body Mass index (BMI) and quality of life among head and neck cancer patients undergoing radiotherapy or concurrent with chemotherapy.

## METHODOLOGY

### Study Design

This is a double-blind randomized study of Head and Neck cancer patients seen at the Jose R. Reyes Memorial Medical Center- Department of Radiotherapy from November 2016 to March 2018 and were subsequently enrolled to either Lentin or placebo through random permutation.

### Patient Population

Patients were given the treatment description along with explanation of the possible benefits and risks prior to obtaining informed consent. Eligible patients were biopsy proven head and neck malignancy from stages I- IVB undergoing radiotherapy alone or concurrent with chemotherapy with an ECOG performance status  $\leq 2$ . Patients were excluded if they were found to have metastasis during CT planning, synchronous malignancy, elevated hepatic and renal enzymes at the onset of treatment, or a case of recurrence.

### Drug Administration

Drug preparations were in powder form packed at 1 gram per sachet. They were instructed to dissolve 1 sachet in  $\frac{1}{2}$  glass of water to be taken three times a day after meals for a total dose of 3 grams per day, to be administered two weeks before the start of treatment, during radiation/chemoradiotherapy, and for two months after completion radiotherapy or radio-chemotherapy. Patients were allowed to take iron and multivitamins as food supplement.

### Hematologic Parameters and Nutritional Assessment

Complete Blood count (CBC), body weight and BMI were obtained 2 weeks before radiation/radiochemotherapy,

<b>Table 1. Demographic Profile of Patients</b>		
	Placebo	Lentin
Median Age	49	54.5
<b>GENDER</b>		
Male	29	24
Female	4	8
<b>RT dose</b>		
70 Gy	29	27
66 Gy	3	1
60 Gy	1	4
<b>Histology</b>		
SCCA	31	31
Adenoid Cystic Carcinoma	1	1
Malignant Ameloblastoma	1	0
<b>Differentiation</b>		
Undifferentiated	12	6
Well differentiated	1	2
Moderately Differentiated	1	2
Poorly Differentiated	6	3
<b>Anatomic Site</b>		
Nasopharyngeal	22	16
Laryngeal	5	6
Maxillary	3	2
Oropharyngeal	1	1
Salivary Gland	1	0
Oral Cavity	1	7
<b>CHEMO given</b>		
Yes	32	28
No	1	4
<b>Stage</b>		
I	0	0
II	5	5
III	8	7
IVA	15	16
IVB	5	4
<b>Clinical Outcomes</b>		
Mortality	11	0
Blood transfusions	17	1
Hospital Admissions	21	2
Metastasis	5	0
Infection	4	0
Recurrence	2	0

then weekly during treatment, and monthly for 2 months following treatment.

#### Quality of Life Measures and Treatment Related Side Effects Evaluation

The EORTC Quality of Life Questionnaires for Head and Neck Cancer Patients QLQ H&N35 and RTOG grading system were used for the evaluation of Quality of Life (QOL) and treatment related side effects. Patients were assessed on a weekly basis 2 weeks before and during radiation/radiochemotherapy, and then once a month for 2 months following treatment.

#### Statistical Analysis

Means and standard deviations were used to summarize the data in quantitative form, such as age, BMI, weight loss, CBC parameters and WBC differential counts, blood chemistry, and QOL results. Gender was summarized using counts and percentages. To determine homogeneity between the two groups, student's t-test and Fischer's exact test was done for mean age and gender. Student's t-test compared the BMI, weight loss, CBC parameters and WBC differential counts, blood chemistry test results of the two groups, while Mann-Whitney Test compared their QOL. Subset analysis was done for clinical outcomes (disease progression, infection, metastasis, hospital admission, blood transfusion and mortality) using Chi square analysis and Fisher's exact tests. All statistical tests were performed in SPSS version 20.0. P-values less than 0.05 indicated statistically significant differences.

## RESULTS

#### Demographic Profile of Patients

A total of 70 patients were selected and only 65 patients were enrolled in the study from November 2016 to February 2018. Patients were enrolled to either to placebo (n= 32) or Lentin (n= 33). The median age was 52 years old, and majority of the patients were male and the predominant site being the nasopharynx with an undifferentiated squamous cell carcinoma histology. Patients were mostly locally advanced stage and were given concurrent chemoradiotherapy. Majority of the total radiation dose prescribed was 70 Gy.

**Table 2.** Demographic Profile Statistical Analysis

	ALL	Placebo	Lentin	p-value
Age (years)	51.24 ± 10.34	49.38 ± 10.77	53.16 ± 9.68	0.148
Gender: Male	50 (80.6%)	27 (87.1%)	23 (74.2%)	0.335

Values expressed as Mean ± SD.

p-values displayed are based on Student's t-test and Fisher's exact test.

#### Complete Blood Count

The mean hemoglobin of the two groups did not differ during pre RT ( $p=0.854$ ) and during RT ( $p=0.537$ ). But at post RT, the mean hemoglobin of the lentin group was significantly higher ( $p=0.010$ ) than the placebo group.

Table 3 shows that at post RT, the mean hemoglobin of the lentin group was higher by 1.30 g/dL [CI<sub>95%</sub>: 0.33 to 2.26] versus the placebo group.

Similarly, the mean hematocrit of the two groups did not differ pre RT ( $p=0.551$ ) and during RT ( $p=0.446$ ). But at post RT, the mean hematocrit of the lentin group was significantly higher ( $p=0.001$ ) than the placebo group.

Table 3 showed that at post RT, the mean hematocrit of the lentin group was higher by 0.05% [CI<sub>95%</sub>: 0.02 to 0.08] versus the placebo group.

**Table 3.** Complete Blood Counts of Patients at Pre RT, during RT and at Post RT

Parameters	Group	Pre RT		RT		Post RT	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Hb (g/dL)	Placebo	14.06 ± 1.72	0.854	12.55 ± 1.29	0.537	10.59 ± 1.53	0.010
	Lentin	14.14 ± 1.56		12.74 ± 1.21		11.89 ± 1.73	
Hct (%)	Placebo	0.42 ± 0.05	0.551	0.37 ± 0.04	0.446	0.31 ± 0.05	0.001
	Lentin	0.41 ± 0.05		0.38 ± 0.04		0.35 ± 0.05	
RBC (x 10 <sup>9</sup> /uL)	Placebo	4.86 ± 0.51	0.330	4.29 ± 0.43	0.196	3.47 ± 0.53	0.004
	Lentin	4.71 ± 0.66		4.46 ± 0.61		4.2 ± 0.93	
WBC (x 10 <sup>3</sup> /uL)	Placebo	9.57 ± 3.67	0.951	9.18 ± 5.25	0.124	6.15 ± 2.23	0.374
	Lentin	9.51 ± 4.3		7.56 ± 2.44		6.72 ± 2.19	
Platelets (x 10 <sup>3</sup> /uL)	Placebo	326.43 ± 90.58	0.404	271.37 ± 60.26	0.739	215.96 ± 78.11	0.017
	Lentin	305.01 ± 104.3		276.96 ± 71.79		271.43 ± 73.36	

p-values based on Student's t-test.

Likewise, the mean RBC of the two groups did not differ pre RT ( $p=0.330$ ) and during RT ( $p=0.196$ ). But at post RT, the mean RBC of the lentin group was significantly higher ( $p=0.004$ ) than the placebo group. Table 3 shows that at post RT, the mean RBC of the lentin group was higher by  $0.73 \times 10^9/\mu\text{L}$  [ $CI_{95\%}$ : 0.25 to 1.21] versus the placebo group. However, the mean WBC of the two groups did not differ pre RT ( $p=0.951$ ), during RT ( $p=0.124$ ) and at post RT ( $p=0.374$ ) (table 3).

On the other hand, the mean platelet counts of the two groups did not differ pre RT ( $p=0.404$ ) and during RT ( $p=0.739$ ). But at post RT, the mean platelet counts of the lentin group was significantly higher ( $p=0.017$ ) than the placebo group. Table 3 shows that at post RT, the mean platelet counts of the lentin group was higher by  $0.73 \times 10^9/\mu\text{L}$  [ $CI_{95\%}$ : 0.25 to 1.21] versus the placebo group.

#### White Blood Cell Differential Counts

The mean neutrophils of the two groups did not differ pre RT ( $p=0.578$ ) and during RT ( $p=0.659$ ). But at post RT, the mean neutrophils of the lentin group was significantly higher ( $p=0.007$ ) than the placebo group. Table 4 shows that at post RT, the mean neutrophils of the Lentin group was higher by 0.18 [ $CI_{95\%}$ : 0.05 to 0.31] versus the placebo group.

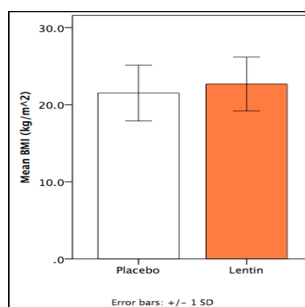
Similarly, the mean lymphocytes of the two groups did not differ pre RT ( $p=0.928$ ) and during RT ( $p=0.204$ ). But at post RT, the mean lymphocytes of the lentin group was significantly higher ( $p=0.045$ ) than the placebo group. Table 4 shows that at post RT, the mean lymphocytes of the lentin group was higher by 0.08 [ $CI_{95\%}$ : 0.01 to 0.14] versus the placebo group. However, the mean eosinophils of the two groups did not differ pre RT ( $p=0.276$ ), during RT ( $p=0.264$ ) and at post RT ( $p=0.315$ ).

The mean basophils of the two groups did not differ pre RT ( $p=0.195$ ), during RT ( $p=0.254$ ) and at post RT ( $p=0.354$ ). The mean monocytes of the two groups did not differ pre RT ( $p=0.469$ ), during RT ( $p=0.275$ ) and post RT ( $p=0.541$ ).

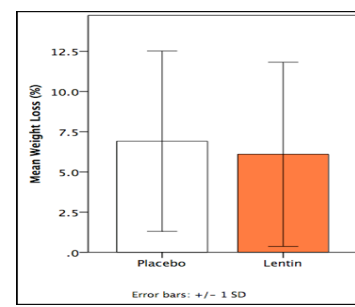
#### Nutritional status of patients

Both arms had a mean BMI of 22.10 (range, 12.7 to 31.2; figure 1) with a weight loss of 6.51% (range, 15.0 to 17.0). The two groups had significant percentage weight loss (Placebo:  $6.91 \pm 5.61$   $p<0.001$ ; Lentin:  $6.10 \pm 5.72$ ,  $p<0.001$ ;

figure 2), the placebo group had a mean weight loss of 6.91% [ $CI_{95\%}$ : 4.9 to 8.9] while the Lentin group had a mean weight loss of 6.1% ( $CI_{95\%}$ : 4.0 to 8.2), the difference did not differ significantly ( $p=0.571$ ).



**Figure 1:** Mean BMI



**Figure 2:** Mean percent weight loss

#### Treatment Related Side Effects

The mean skin ( $p=0.102$ ), mucous membrane ( $p=0.808$ ), eye ( $p=0.523$ ), ear ( $p=0.500$ ), saliva ( $p=0.124$ ), pharynx ( $p=0.188$ ) and larynx ( $p=0.073$ ) side effects of the two groups did not differ.

**Table 5.** RTOG Severity Grading of Radiation Toxicities

	Placebo	Lentin	p-value
Skin	0.95 ± 0.34	0.81 ± 0.31	0.102
Mucous Membrane	0.65 ± 0.43	0.62 ± 0.42	0.808
Eye	0.05 ± 0.12	0.03 ± 0.1	0.523
Ear	0.23 ± 0.31	0.17 ± 0.33	0.500
Saliva	1.14 ± 0.47	0.96 ± 0.47	0.124
Pharynx	0.75 ± 0.41	0.62 ± 0.39	0.188
Larynx	0.56 ± 0.45	0.37 ± 0.36	0.073

Values expressed as Mean ± SD. p-values displayed based on Student's t-test.

#### Quality of Life

The QoL of Patients treated with Lentin was significantly better ( $p=0.019$ ) than patients under the placebo group.

**Table 6.** Quality of Life Scores of Patients

Group	Mean QoL scores	p-value
Placebo	1.72 ± 0.33	0.019
Lentin	1.53 ± 0.24	

Values expressed as Mean ± SD. p-values based on Mann-Whitney test.

**Table 4.** WBC Differential Counts of Patients at Pre RT, during RT and at Post RT

Parameters	Group	Pre RT		RT		Post RT	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Neutrophils	Placebo	0.64 ± 0.10	0.578	0.72 ± 0.08	0.659	0.51 ± 0.31	0.007
	Lentin	0.65 ± 0.11		0.71 ± 0.08		0.69 ± 0.12	
Lymphocytes	Placebo	0.28 ± 0.10	0.928	0.22 ± 0.09	0.204	0.19 ± 0.14	0.045
	Lentin	0.28 ± 0.10		0.25 ± 0.11		0.26 ± 0.11	
Eosinophils	Placebo	0.03 ± 0.02	0.276	0.03 ± 0.02	0.264	0.04 ± 0.06	0.315
	Lentin	0.04 ± 0.04		0.05 ± 0.08		0.02 ± 0.03	
Basophils	Placebo	0.01 ± 0.02	0.195	0.02 ± 0.02	0.254	0.01 ± 0.02	0.354
	Lentin	0.01 ± 0.02		0.03 ± 0.06		0.00 ± 0.01	
Monocytes	Placebo	0.07 ± 0.12	0.469	0.06 ± 0.06	0.275	0.04 ± 0.04	0.541
	Lentin	0.05 ± 0.04		0.09 ± 0.16		0.06 ± 0.11	
Stabs	Placebo	0.00 ± 0.00	-	0.000 ± 0.000	0.200	0.00 ± 0.00	-
	Lentin	0.00 ± 0.00		0.001 ± 0.010		0.00 ± 0.00	

### Clinical Outcomes

Table 7 presents the clinical outcomes of the patients in the study.

**Table 7.** Clinical Outcomes

Outcome	Placebo	Lentin	P-value
Mortality	11	0	0.000339377
Blood transfusions	17	1	0.00001
Hospital Admissions	21	2	0.000001
Metastasis	5	0	0.028733562
Infection	4	0	0.06043956
Progression	2	0	0.253846154

p-values displayed are based on Chi square test and Fisher's exact test.

### DISCUSSION

The results of this study showed that upon completion of radiochemotherapy (2 months post RT/CRT), patients who were treated with Arabinoxylan rice bran (Lentin) showed significantly higher mean hemoglobin ( $p=0.010$ ), hematocrit ( $p=0.001$ ), RBC ( $p=0.001$ ) and platelets ( $p=0.017$ ) and this was accompanied with significantly higher neutrophil count ( $p=0.007$ ) and lymphocyte count ( $p=0.045$ ). Both groups had significant weight loss ( $p<0.001$ ). Lastly, patients treated with Lentin had better quality of life ( $p=0.019$ ) and lower treatment related toxicities compared to the placebo group.

Combining treatment modalities of radiation and chemotherapy in the management of certain head and neck malignancies have been proven to improve outcomes in local control and survival but these come at the expense of increased treatment toxicity rates. Patients who were unable to tolerate the combined regimen have suffered treatment delays that resulted to poorer outcomes with hematopoietic tissues (which are most sensitive to ionizing radiation) suffering the immediate effects of exposure.<sup>(6-8)</sup>

In this study, based on overall complete blood count results, there were higher values on all hematologic parameters in the Lentin arm. The pre-treatment (2 weeks loading dose) CBC values showed higher hemoglobin, hematocrit, RBC, neutrophilic, lymphocytic, eosinophilic and basophilic counts in

the Lentin arm compared to placebo. During radiotherapy/chemoradiotherapy, patients given Lentin had higher values in all parameters except for the decrease in WBC, however, this was not statistically significant. While on post-treatment hematologic assessment (2 months), Lentin treated patients had better results in all parameters which were statistically significant based on its ability to maintain the hemoglobin, hematocrit, RBC count, platelet count, neutrophil and lymphocyte counts within normal range compared to the placebo counterpart where a marked decreased in neutrophil and lymphocyte count was predominant. These RBC indices, more specifically the hemoglobin values, were of paramount importance as higher values coincided with better tumoricidal property in radiation therapy resulting to superior local control and overall survival. Ghoneum et al reported on the protective effect of Lentin on the overall maintenance of hematopoietic tissues in mice after exposure to gamma irradiation and found out that Lentin could be used as a radioprotector against gamma irradiation induced depletion of WBC, RBC indices including hemoglobin, hematocrit, RBC count and platelet count by preventing immune system dysfunction<sup>17</sup>.

On the nutritional status, recorded weight and BMI on follow-ups showed higher overall BMI for Biobran/RBAC (22.69) compared to placebo (21.52) and a lower percent weight loss on Biobran/RBAC (6.10%) versus placebo (6.91%). Treatment related toxicity using the RTOG grading showed lower severity scores on all parameters in Biobran/RBAC compared to placebo. Quality of Life scores using EORTC H&N35 were worst in placebo compared to Lentin. Deaths during the course of treatment were significantly higher in placebo (11) compared to the Lentin with no recorded treatment related mortality. A study done by Masood et al who evaluated the effects of Lentin among breast cancer patients in reducing chemotherapy induced side effects observed that patients taking Lentin had significant reduction in tiredness, fatigue, anorexia, nausea and hair fall. These patients were unlikely to need anti-emetics, appetizers or food supplements as they reported improved quality of life<sup>13</sup>. The same findings were reported by Petrovics et al among cancer patients who were suffering from chronic fatigue syndrome and

were treated with Lentin and oncothermia concluded that these patients had reduced pain and better quality of life through enhance NK cell activity<sup>18</sup>.

A subgroup analysis done showed that patients taking Lentin had lower rates of blood transfusion and hospital admission and no incidence of tumor progression, infection and metastases as compared to placebo. These have led to lesser treatment delays, avoidance of treatment mortalities and morbidities, more patients completing the treatment and improved quality of life among head and neck cancer patients undergoing radiotherapy/chemoradiotherapy.

## LIMITATIONS AND RECOMMENDATIONS

The number of participants in this double-blind randomized pilot study was low, however the results were promising - revealing significant improvement in clinical outcome after Lentin administration. Certain medications such as those for pain were not withheld and were given upon the discretion of the attending physician and the patients' symptoms. Based on the data, performing a study on different cancer sites with the same treatment modality would corroborate with our findings. Also, the results obtained did not immediately translate to improved outcomes in terms of local control, overall survival, disease free survival and recurrence free survival. These parameters are best obtained with 5 to 10 years of follow up, of which we believe could be a prospect for future studies.

## CONCLUSION

The study showed better clinical outcomes based on hematologic parameters, nutritional status, treatment-related toxicities and quality of life in Arabinosylian rice bran (Lentin) compared to placebo undergoing radiochemotherapy. This suggests that Lentin might be a potential adjunct in preventing radiation induced side effects among head and neck cancer patients.

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## REFERENCES

1. Cadoni G, Giraldo L, Petrelli L, et al. Prognostic factors in head and neck cancer: a 10-year retrospective analysis in a single-institution in Italy Fattori prognostici del tumore testa-collo: un'analisi retrospettiva monocentrica di 10 anni. *Acta Otorhinolaryngol Ital.* 2017;37(6):458-466.
2. Harrison LB, Shasha D, Homel P (2003) Prevalence of anemia in cancer patients undergoing radiotherapy: prognostic significance and treatment. *Oncology* 63(suppl 2):11-18
3. Shasha, D., Harrison, L: Anemia Treatment And the Radiation Oncologist: Optimizing Patient Outcomes. Review Article Cancer Network [ONCOLOGY

- 15:1486-1496, 2001
4. Biobran MGN 3- Overview; <http://www.biobran.org/overview/>
5. Lee WR, Berkey B, Marcial V, et al: Anemia is associated with decreased survival and increased locoregional failure in patients with locally advanced head and neck carcinoma: A secondary analysis of RTOG 85-27. *Int J Radiat Oncol Biol Phys* 42:1069-1075, 1998.
6. E.J. Hall, A.J. Giaccia. *Radiobiology for the Radiologist*. Lippincott Williams & Wilkins, Philadelphia (2006). pp. 29-32
7. Mauch, P., Constine, L., Greenberger, J. et al, Hematopoietic stem cell compartment: Acute and late effects of radiation therapy and chemotherapy. *Int J Radiat Oncol Biol Phys.* 1995;31:1319-1339.
8. Takahara K, Sano K. The life prolongation and QOL improvement effect of rice bran arabinosylian derivative(MGN-3/Bio-Bran) for progressive cancer. *Clin Pharmacol Ther* 2004;14:267-71
9. Biobran MGN 3- Overview; <http://www.biobran.org/overview/>
10. Miura T, Chiba M, Miyazaki Y, Kato Y, Maeda H. Chemical structure of the component involved in immunoregulation. In: *BioBran/MGN-3 (Rice Bran Arabinosylian Compound): Basic and Clinical Application to Integrative Medicine*. 2nd ed. Tokyo, Japan: BioBran Research Foundation; 2013:14-22.
11. Ooi SL, McMullen D, Golombick T, Nut D and Pak SC: Evidence-based review of BioBran/MGN-3 arabinosylian compound as a complementary therapy for conventional cancer treatment. *Integr Cancer Ther.* Oct 1-2017
12. Masood AI, Sheikh R, Anwer RA. Effect of "Biobran MGN-3" in reducing side effects of chemotherapy in breast cancer patients. *Professional Med J Feb* 2013;20(1):013-016.
13. Kaketani K. A case where an immunomodulatory food was effective in conservative therapy for progressive terminal pancreatic cancer. *Clin Pharmacol Ther.* 2004;14:273-279.
14. Okamura Y. The clinical significance of modified arabinosylian from rice bran (BioBran/MGN-3) in immunotherapy for cancer. *Clin Pharmacol Ther.* 2004;14:289-294.
15. Gridley DS, Pecaat MJ, Miller GM et al. Dose and dose rate effects of whole-body gamma-irradiation: II. Hematological variables and cytokines. *In Vivo* 2001;15:209-16.
16. Ghoneum, M, Badr El-Din, N, Fattah, et al: Arabinosylian rice bran (MGN-3/Biobran) provides protection against whole-body  $\gamma$ -irradiation in mice via restoration of hematopoietic tissues *Journal of Radiation Research*, 2013, 54, 419-429 doi: 10.1093/jrr/rrs119 Advance Access Publication 3 January 2013
17. Petrovics G, Szigeti G, Hamvas S, Máté Á, Betlehem J, Hegyi G. Controlled pilot study for cancer patients suffering from chronic fatigue syndrome due to chemotherapy treated with BioBran (MGN-3-Arabinosylian) and targeted radiofrequency heat therapy. *Eur J Integr Med.* 2016;8:29-35.
18. Ghoneum M (2016) From bench to bedside: The growing use of arabinosylian rice bran (MGN-3/Biobran) in cancer immunotherapy. *Austin Immunology* 1: 1006-1013.

# Concordance of Chest X-ray and Lung Ultrasound Findings in the Evaluation of Pulmonary Congestion among Patients who Underwent Congestion Pneumonia Package Imaging at The Medical City

3rd place, Philippine College of Radiology Research Contest, Oral Presentation

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The Medical City

## ABSTRACT

Congestion Pneumonia Package Imaging is a novel protocol in The Medical City which combines chest x-ray and lung ultrasound in assessing patients who are suspected of pulmonary congestion. In this study, LUS and CXR images of 307 patients who underwent CPPI were each interpreted in no particular order by a single radiologist. The results were recorded and findings in both CXR and LUS are matched to determine agreement/concordance. The study confirmed that there is a positive concordance between the two modalities in diagnosing pulmonary congestion. Other conditions such as pneumonia and pleural effusion did not demonstrate significant concordance. The results suggest that a recommendation may be given for doctors to request for a single modality (particularly LUS) rather than two modalities combined. The use of LUS as a single modality in the diagnosis of pulmonary congestion has implications in efficiency, resource use and cost. This is most beneficial particularly in the acute setting of managing of pulmonary congestion such as in the ER and ICU. Further studies with other standards for diagnosing pulmonary congestion and other chest conditions (i.e. chest CT scan and clinical/laboratory assessment) may be used alongside CXR and/or LUS to confirm the presence of the disease. Also, future studies may explore using data from follow up of patients after treatment of pulmonary congestion to validate the concordance of LUS and CXR findings.

## INTRODUCTION

Chest X-ray (CXR) is the traditional first line procedure to assess patients suspected of pulmonary congestion. However, it is known that interpretation of radiologic signs, such as vascular opacity redistribution and interstitial edema, are often questionable and subjective, while different levels of expertise of the readers may cause high inter-observer variability. In doubtful cases, lung ultrasound (LUS) has been shown to be of value in assessing pulmonary congestion by evaluation of vertical comet tail artifacts named B-lines. These artifacts represent easy-to-acquire and highly reproducible signs of pulmonary congestion<sup>1</sup>.

For the past year, The Medical City has been utilizing the advantages of both modalities by coming up with the Congestion Pneumonia Package Imaging (CPPI). The aim of the procedure is to aid clinicians in reliably assessing patients who are suspected of pulmonary congestion. CPPI was initially performed among dialysis patients who present with dyspnea. In patients whose radiographs could not exclude both pneumonia and congestion, the LUS is relied upon in differentiating the two disease entities based on differences in their imaging findings. Currently, the CPPI protocol is being used in the hospital not only for dialysis patients but also for a number of patients suspected of having pulmonary congestion in the emergency room (ER) and intensive care unit (ICU). A few other patients from the outpatient department (OPD) are also availing of the CPPI procedure.

Chest radiographs can aid in identifying pulmonary congestion as an underlying cause in patients with dyspnea, but the overall accuracy of the presence or absence of congestive heart failure on radiographs are low. Findings of pulmonary congestion/edema on chest radiographs are known to lag behind clinical changes.<sup>2</sup> On the other hand, lung ultrasound may help to rapidly discriminate between cardiogenic and non-cardiogenic causes of dyspnea. Utilizing both modalities leads to a more reliable process in detecting pulmonary congestion

but entails more time, cost, resources, and efforts. By collecting the data and providing the results at the end of the study, a single- (xray or ultrasound) or dual-modality protocol (xray and ultrasound) can be established for patients with pulmonary congestion or another underlying disease in a given clinical scenario yielding a more cost-effective, efficient and reliable detection of pulmonary congestion. This hopefully leads to better management and treatment outcomes.

## REVIEW OF RELATED LITERATURE

Pulmonary congestion is a critical finding among patients with acute heart failure and end-stage renal disease (ESRD). In cardiac failure, it is a result of several mechanisms such as fluid retention among patients with reduced ejection fraction. Also, it is due to fluid redistribution to the lungs, usually without weight variation, in patients with preserved ejection fraction and a noncompliant cardiovascular system.<sup>6</sup> As for ESRD, impaired pulmonary function may be a consequence of circulating uremic toxins or directly from pathologic conditions that are common among ESRD patients such as fluid overload, anemia, immune suppression, malnutrition, electrolyte disorders and acid-base imbalances. Fluid overload in particular is an important factor in the pulmonary function of ESRD patient. When combined with an increase in pulmonary capillary permeability, these factors can result in pulmonary edema and pleural effusion which would eventually lead to a decrease in pulmonary function.<sup>4</sup>

As pulmonary congestion progresses, signs and symptoms of pulmonary congestion resulting in interstitial and alveolar edema are clinically evident as part of acute heart failure syndrome. The identification of pulmonary congestion with a reliable and objective non-invasive imaging biomarker would confer a pathophysiological, diagnostic, therapeutic, and prognostic advantage.<sup>6</sup> Currently, there are two basic and easy to perform imaging modalities that would yield findings indicative of pulmonary congestion - these are CXR and LUS.

However, there are some limitations in the use of CXR to evaluate pulmonary congestion/edema. There is inter-observer variability in identifying radiographic signs of this condition such as redistribution of the vessels, peribronchial cuffing and septal lines. These signs are also highly dependent on image acquisition and reader familiarity. Radiological signs of vascular overload may also depend on the patient position during imaging (upright versus supine). The distinct radiologic features of parenchymal opacities in patients with pulmonary edema shows high specificity but very low sensitivity. The use of CXR has a sensitivity of 70% and a specificity of 100%. The delay in the appearance of features of frank pulmonary edema in CXR results to a low sensitivity of this modality in diagnosing this condition<sup>5</sup>. Despite these limitations, a CXR is still the initial examination of choice being performed in patients in the ER for shortness of breath. Its relatively low dose of ionizing radiation administered to the patients and immediate view of the entire chest are some of its advantages<sup>6</sup>.

The use of LUS to assess pulmonary congestion only started in 2015. Lung artifacts, particularly B-lines, became important markers in the context of this disease<sup>4</sup>. Extravascular lung water can be detected by ultrasound beams as they collect within the subpleural interlobular septa and thickened by edema. The characteristic B-lines are described as “comet tails or laser-like” vertical hyperechoic reverberations arising from the pleural line and move in unison with lung sliding. Three or more B-lines between two ribs in a single scan is considered as a marker of pulmonary edema<sup>5</sup>.

Compared to CXR, the use of LUS is limited in providing a panoramic view of the chest. But despite this limitation, LUS is more sensitive than CXR in the diagnosis of early signs of interstitial thickening due to pulmonary congestion. It has a sensitivity of 93% and specificity of 93%<sup>6</sup>. Moreover, the ability of LUS to be performed bedside during the first clinical approach is also beneficial. It only requires an imaging time of a few minutes which is helpful in evaluating a dyspneic patient in an emergency setting. The use of ultrasound is also void of radiation which may decrease the need for CXR among patients who already have increased levels of diagnostic radiation exposure<sup>7</sup>. Recently, bedside LUS is also being used in patients managed in the ICU setting for multiple lung disorders. LUS can provide quantitative data in quantifying pleural effusion, monitoring lung consolidations and pneumothoraces<sup>6</sup>.

In a study done by Zanobetti, patients with pulmonary diseases (i.e. pulmonary fibrosis, pleural effusion and pneumothorax) showed good concordance between CXR and LUS. This is especially true for pulmonary edema with the highest kappa value of 95%.

## METHODOLOGY

### *Population and Sample*

Ultrasound and chest xray images of patients who underwent CPPI for evaluation of pulmonary congestion in The Medical City from January 2017 to December 2017 were used in this study. For this study, a total of 307 patients was comput-

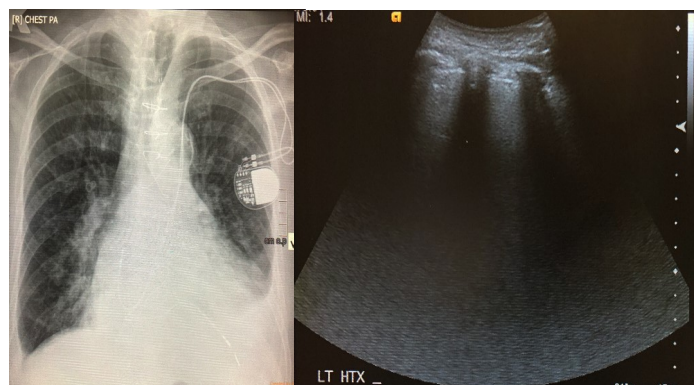
ed for sample size. CXR and LUS images from all patients were included regardless of the clinical scenario/setting (emergency, in-patient or out-patient) where the referral came from. Criteria for exclusion were based on unavailability of records in the Syngo database, interval of more than 2 hours between the performance of each of the two modalities (CXR and LUS), and incomplete set of ultrasound images which were not taken in accordance to the standard hospital protocol for obtaining chest images (taken in six sections on each side of the chest using a 3.5 MHz curvilinear probe).

### *Methods*

A retrospective, blinded and observational study was performed. Patient records and images were retrieved using the Syngo and Orion databases of the hospital. A blinded review was performed by the co-investigator (a radiology consultant who has been in practice for more than 10 years and is considered an expert in interpretation of x-ray and ultrasound images). The list of patients who underwent the CPPI from January 2017 to December 2017 were retrieved from the hospital database. From the list, 307 patients were included through random numbers selection. The chest x-rays of these 307 patients were evaluated by the co-investigator in random order without knowledge of the official report. In a separate setting, the LUS images of the same set of patients were presented to the investigator in random order for image interpretation.

### *Analysis*

The CXR and LUS images of the randomly selected patients were evaluated for the presence of pulmonary congestion. In the CXR, pulmonary congestion was considered positive when radiologic signs such as vascular opacity, redistribution and interstitial edema are present<sup>1</sup>. The presence of more than 5 vertical comet tail artifacts, termed B-lines, consistently in six sections (upper, mid and lower of the anterior and posterior aspects) on both sides of the chest confirmed the presence of congestion in LUS (see Figure 1). Only the co-investigator assessed the entire population of CXR and LUS to prevent inter-rater variability. The CXR and LUS of the 307 patients interpreted in no particular order were recorded and the findings



**Figure 1. CXR and LUS images.** The CXR shows vascular redistribution with prominence of the hilar vessels (left image). The LUS image of the same patient reveals presence of multiple B-lines (right image).

of both modalities were subsequently matched per patient afterwards. Frequency, percentage and mean were used to describe the patient profile, while number and percentage of findings were used to describe the specific chest conditions (pulmonary congestion, pneumonia and pleural effusion) from the CXR and LUS modalities. Kappa test of agreement, was used to determine the agreement of CXR and LUS. This test is considered to be the statistical test used when testing the agreement of two categorical variables with the same measurement. In terms of correlation, a Kappa coefficient of < 0.20 was interpreted poor, 0.21 - 0.40 was fair, 0.41 - 0.60 was moderate, 0.61 - 0.80 was good, and 0.81 - 1.00 was very good. SPSS version 20.0 and Medcalc Version 12.0 were used for data analysis. Ninety-five (95%) confidence interval was used to determine the significance of the findings.

## RESULTS

The average age of patients whose images were used in this study was  $69.13 \pm 16.16$  or 69 years old. The patients who were referred for CPPI were predominantly female, composing 51.5% of the total population while 48.5% were male patients. More than half of the patients were in-patients (59.3%) while 34.2% came from the emergency department and only 6.5% were out-patient referrals (see Table 1). Among patients who were referred for CPPI, 38.1% of patients were

Table 1: Patient profile

	Frequency / Mean	Percentage / SD
Age	69.13	16.16
Gender		
Male	149	48.5%
Female	158	51.5%
Source of Referral		
IPD	182	59.3%
EMR	105	34.2%
OPD	20	6.5%

positive for pulmonary congestion in CXR which was only slightly lower compared to LUS findings with 40.7% positive cases. On the other hand, 61.9% of patients did not have pulmonary congestion on CXR and a close percentage of 59.3% of patients were also negative in LUS (see Table 2). Based on these figures, there was significant agreement between the two modalities in the evaluation of pulmonary congestion. Among the 307 patients, 92.8% of cases was concordant with a strong level of agreement of 0.850 (0.79 to 0.91). However, there was no significant agreement between the other CXR Findings and LUS findings. The agreement rate of pleural effusion in CXR and LUS was 58.0% with with kappa coefficient of 0.080 (-0.03 to 0.19) while 59.6% was the agreement rate of pneumonia with consolidation in CXR and LUS with kappa coefficient of 0.029 (-0.03 to 0.09). Nevertheless, there was a high percent-

age (96.2%) of patients with the same findings of negative for pneumonia in both CXR and US. Moreover, at least 76% of patients had negative findings in both x-rays and ultrasound. It was also noted that there was a high percentage (93.6%) of patients whose LUS was positive for pneumonia but negative on CXR.

Table 2: Pulmonary congestion in CXR and LUS

	Frequency	Percentage
Pulmonary Congestion (CXR)		
Positive	117	38.1%
Negative	190	61.9%
Pulmonary Congestion (LUS)		
Positive	125	40.7%
Negative	182	59.3%

## DISCUSSION

Our study demonstrated high concordance between CXR and LUS (Kappa coefficient of 0.850) in the assessment of pulmonary congestion. In contrast, there was poor agreement with other pulmonary diseases such as pleural effusion and pneumonia although a high percentage of patients had the same findings of absence of pneumonia in the two modalities. In patients with normal chest ultrasound results, chest radiographs were more likely to be normal as well. The results suggest that a single modality may suffice in the evaluation of pulmonary congestion. This has implications in terms of the efficiency in the diagnosis, cost of diagnostic procedures and subsequently in the delivery of patient care. For instance, in the emergency room setting which consisted more than a third of the population in this study, to rule out pulmonary congestion, a patient can undergo just one procedure - LUS, lowering the cost and decreasing the time spent for diagnostic imaging. In this patient, when the LUS is normal, a request for chest radiograph can be avoided. If the LUS finding is pulmonary congestion, similarly the CXR may not be done as it would most likely reveal the same findings. However, if other findings are being considered (e.g. pleural effusion, pneumonia, etc.), combining both modalities would still be necessary to come up with a more definite diagnosis. Nonetheless, in patients showing negative findings for pneumonia and pleural effusion, a single modality of either CXR or LUS could also be considered sufficient when compatible with clinical findings.

Considering the smaller amount of time necessary to perform an LUS compared with CXR, and absence of patient exposure to ionizing radiation, LUS could be recommended as the standard first routine imaging modality in patients in an emergency setting being treated for pulmonary congestion. This may also be considered ideal for patients in the ICU since LUS is portable and more convenient to use for patients who are in distress and have difficulty ambulating. Given the results of the high concordance of LUS and CXR in the diagnosis of pulmonary congestion, a single study is sufficient. A single

**Table 3:** Agreement test of Ultrasound and Chest X-ray for other findings

Chest X-ray	Ultrasound		Agreement %	Kappa Coefficient	P-value	Interpretation
	Positive	Negative				
<b>Pulmonary congestion</b>						
Positive	110 (88.0%)	7 (3.8%)	92.8%	0.850 (0.79 to 0.91)	0.000	S
Negative	15 (12.0%)	175 (96.2%)				
<b>Pleural effusion</b>						
Positive	39 (31.2%)	43 (23.6%)	58.0%	0.080 (-0.03 to 0.19)	0.150	NS
Negative	86 (68.8%)	139 (76.4%)				
<b>Pneumonia with consolidation</b>						
Positive	8 (6.4%)	7 (3.8%)	59.6%	0.029 (-0.03 to 0.09)	0.420	NS
Negative	117 (93.6%)	175 (96.2%)				

modality instead of a combined LUS and CXR would also have a beneficial impact on cost and use of resources.

One limitation of this study is that the LUS diagnosis was based solely from still ultrasound images rather than a cineloop/video. Another limitation is that these images were taken by several and different sonologists. Given that ultrasound in general is operator dependent, the nature of how the scans were performed could not be controlled by the investigators. A prospective study where the ultrasound scans are performed by a single sonologist could lead to a more accurate assessment.

A more important limitation of our study is that the basis for diagnosing pulmonary congestion was CXR and LUS, both of which are currently not considered the gold standard for the diagnosis of pulmonary diseases. The use of a gold-standard such as performing a chest CT scan may be beneficial in future studies in order to confirm the presence of pulmonary congestion and validate the concordance of LUS and CXR<sup>11</sup>. The use of chest CT scan among the current population was not done since the procedure is not yet part of the current CPPI protocol. Studies which include correlation with clinical and laboratory assessment may also be useful in arriving with a more accurate and definitive diagnosis of pulmonary congestion. A study which involves findings of patients followed up after treatment of pulmonary congestion may also be done in the future to further validate the agreement between CXR and LUS established in this study.

## REFERENCES

- Cardinale, L., Priola, A. M., Moretti, F., & Volpicelli, G. (2014). Effectiveness of chest radiography, lung ultrasound and thoracic computed tomography in the diagnosis of congestive heart failure. *World Journal of Radiology*, 6(6), 230–237. <http://doi.org/10.4329/wjr.v6.i6.230>
- Martindale, J. et. al. (2013). Diagnosing pulmonary edema: lung ultrasound versus chest radiography. *European Journal of Emergency Medicine* 2013, 20:356–360.
- Volpicelli G et. al. (2011). Lung ultrasound in diagnosing and monitoring pulmonary interstitial fluid. *Chest Radiology*.
- Yilmaz, S. et. al. (2016). Pulmonary Function in Patients with End-Stage Renal Disease: Effects of Hemodialysis and Fluid Overload. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*, 22, 2779–2784. <http://doi.org/10.12659/MSM.897480>
- Elnaem, W.H. et. al. (2017). The relative efficacy of chest ultrasonography in comparison to other diagnostic modalities in the evaluation of dyspneic

patient. *Egyptian Journal of Chest Diseases and Tuberculosis.*, 66(1), 165-168. <https://doi.org/10.1016/j.ejcdt.2016.12.005>

- Elmahalawy, I. et. al (2017). Role of thoracic ultrasound in diagnosis of pulmonary and pleural diseases in critically ill patients. *Egyptian Journal of Chest Diseases and Tuberculosis* 66 (2017) 261–266
- Eugenio Picano, Patricia A. Pellikka (2016). Ultrasound of extravascular lung water: a new standard for pulmonary congestion, *European Heart Journal*, Volume 37, Issue 27, 14 July 2016, Pages 2097–2104, <https://doi.org/10.1093/eurheartj/ehw164>
- Simic A. et. al. (2017). Clinical application of lung ultrasound in emergency department patients for the evaluation of pulmonary congestion: a comparison with chest X-ray. *Signa Vitae* 13(Suppl 1):65-67.
- Pappas L. et. al. (2011). Pulmonary Congestion in Acute Heart Failure: From Hemodynamics to Lung Injury and Barrier Dysfunction. *Rev Esp Cardiol*. 2011;64:735-8
- Roguin A, Behar D, Ben Ami H, Reisner SA, Edelstein S, Linn S, et al. Long-term prognosis of acute pulmonary oedema: an ominous outcome. *Eur J Heart Fail* 2000;2(2):137-44.
- Zanobetti M. et. al. (2011). Can Chest Ultrasonography Replace Standard Chest Radiography for Evaluation of Acute Dyspnea in the ED? *CHEST Journal*; 139(5): 1140 – 1147

# Association of Epicardial Fat Enhancement with Epicardial Fat Thickness and Severity of Coronary Artery Disease Using Coronary CT Angiography

Consolation Prize, Philippine College of Radiology Research Contest, Oral Presentation

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## ABSTRACT

Epicardial adipose tissue is the fat located within the pericardial sac. According to Hirata et al, EAT not only serves as an energy storage but also secretes adipocytokines, various bioactive substances which may function as inflammatory mediators. Alexopoulos et al mentioned that there are evidences stating EAT may be associated with the development of coronary artery disease through several paracrine mechanisms, such as the local release of inflammatory mediators that trigger the atherosclerotic process, and other systemic effects. The purpose of this study is to determine the association between epicardial fat enhancement with epicardial fat Recognition of an association between these variables can contribute to the risk stratification of these patients who are assessed with CAD. A total of 45 subjects were included for the study. Data were obtained from the CCTA by measuring the mean EFE and epicardial fat thickness from four different coronary arteries. A value of equal to or more than 15 HU suggest significant enhancement. Agatston score and degree of coronary artery disease were also determined. Significant coronary artery stenosis was defined by luminal stenosis of greater than 50% due to calcified and/or non-calcified plaques. The EFE was correlated with epicardial fat thickness, with severity of CAD, and with Agatston score. The data were then tabulated and analyzed using Pearson and Spearman's rho correlation. Results revealed that there is moderate correlation between enhancement of the EAT and the severity of CAD and Agatston score, and weak correlation between the EFE and epicardial fat thickness. This information can aid clinicians in the assessment of their patients. This may also be used as part of the risk stratification clinicians use in patients suspected with CAD when CCTA is requested.

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# The Relationship between Femoral Intercondylar Notch Width Index and the Incidence of Anterior Cruciate Ligament Tears in Traumatic Knee Injury

Consolation Prize, Philippine College of Radiology Research Contest, Oral Presentation

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## ABSTRACT

Anterior cruciate ligament (ACL) injury is the most common ligament injury of the knee and commonly occurs during sports activities. The high prevalence and cost of this injury have prompted the search for predictive factors and identify populations at risk with the long-term goal of reducing the rate of injury. ACL tears occur most commonly during sports that involve sudden stops and changes in direction like basketball, soccer, tennis and volleyball. In a nation obsessed with basketball, identification of risk factors in basketball players is highly beneficial in injury prevention that may result to loss of playing time due to surgery and rehabilitation. The purpose of this study is to compare the mean intercondylar notch width indexes (NWI) of knees with and without ACL injury using MR images in adult patients with recent history of trauma from July to December 2017. Those with concomitant ligament injury, history of knee fracture, prior knee surgery, known connective tissue or systemic bone disease were excluded from the study. Notch and femoral width measurements were obtained and NWI was calculated for each patient. A total of 103 patients were included in the study. The average age of patients was 39 years old, with a standard deviation of 15.4. The most commonly injured ligament was the medial collateral ligament (N = 7, 30.43%), followed by the combination of the medial collateral and lateral collateral ligaments (N = 6, 26.08%). Of the 103 patients with history of trauma, ACL injury was noted in 50 patients (48.54%). The most common mechanism of injury was secondary to twisting (N = 22, 34%) followed by those related with sports (N = 17, 40%). Unpaired t-test was performed. The resulting p value ( $t = 9.89587, p \leq .05$ ) of the case and control groups showed that there was a statistical difference between their means. This study confirms that a narrow NWI is associated with increased risk for ACL injury. Therefore, appropriate screening using morphometric parameters and radiography or MRI is beneficial to determine if active individuals are at risk. And if so, preventive measures such as specialized training may be undertaken and protective gears may be worn.

## POSTER PRESENTATION

### Comparison of ICRU 38 Rectal Reference Point Dose Estimates with Measured Dose In-Vivo in Cobalt-60 HDR Brachytherapy for Cervical Cancer

1st Place, Philippine College of Radiology Research Contest, Poster Presentation  
*Cesar Vincent L. Villafructe III, MD*  
*University of the Philippines-Philippine General Hospital*

#### ABSTRACT

The objective of this study was to compare the ICRU 38 calculated rectal dose with in-vivo dosimetry measured doses in Cobalt-60 HDR brachytherapy for cervical cancer. A total of 48 brachytherapy insertions done on 15 patients treated from January to March 2017 at our institution were included in this prospective cross sectional study. The results demonstrated no significant difference between the computed ICRU rectal point dose and in-vivo maximum measured rectal dose ((r) 0.6208,  $p < 0.0001$  [S]; t-test  $p = 0.1578$  [NS] 95%CI -0.78 to 0.46), but a significant difference between ICRU rectal point and in-vivo mean measured rectal dose ((r) 0.6033,  $p < 0.0001$  [S]; t-test  $p < 0.0001$  [S] 95%CI: -0.81 to 0.35). These findings were seen even when sub-analyzed for the two used fraction sizes of 7Gy and 8Gy. The results also showed no significant differences in the maximum ((r) 0.9029,  $p < 0.0001$  [S]; t-test  $p = 0.2576$  [NS], 95%CI -0.21 to 0.06) and mean ((r) 0.9766,  $p < 0.0001$  [S]; t-test  $p = 0.2786$  [NS], 95%CI -0.93 to 0.03) doses taken from treatment planning system assigned dose points coinciding with the imaged probes of the in-vivo dosimeter. Over-all, this study was able to provide additional evidence that in-vivo dosimetry can be validly used in the clinical setting to estimate the dose to the rectum during Co60 HDR brachytherapy. Use of this technique allows for an additional quality assurance method that can contribute to reductions of errors in dose delivery.

### Accuracy of D-Dimer among Adult Patients who Underwent CT Pulmonary Angiography in Detecting Pulmonary Embolism in a Tertiary Private Hospital

2nd Place, Philippine College of Radiology Research Contest, Poster Presentation  
*Maria Louella V. Molina, MD; Christina Paola B. Pacpaco, MD;*  
*Mercedes D. Dizon, MD*  
*St. Luke's Medical Center - Global City*

#### ABSTRACT

**OBJECTIVE:** The main objective of the study is to determine the accuracy of D-dimer among adult patients who underwent CT pulmonary angiography in detecting pulmonary embolism in a tertiary private hospital. **METHODS:** This is a cross sectional study among 40-80 year old patients who underwent CTPA with matching D-dimer results. Subjects were searched through the Picture Archiving Communication System (PACS) at Institute of Radiology St. Luke's Medical Center - Global City. **RESULTS:** Fifty eight patients with age ranging from 23 to 90 years were included. Of the 58 patients, 27 (46.6%) were

positive for PE on CTPA. There was no significant difference in the D-dimer ( $p = 0.52$ ), but a trend towards higher D-dimer was noted among those with (+) CTPA. A D-dimer of  $>500$  was significantly associated with CTPA ( $p < 0.01$ ). Sensitivity, specificity, and accuracy of D-dimer cut-off of  $>500$  were 96.3%, 29%, and 60% respectively. NPV and PPV were 90% and 54.2% respectively. Significantly higher proportion of patients with PE by CTPA was noted among those with D-dimer known value of  $>246$ . All 27 patients who had PE by CTPA had positive D-dimer ( $>246$ ). Of the 31 patients negative for PE by CTPA, 25 (80.6%) had positive D-dimer ( $>246$ ). The recorded sensitivity, specificity, and accuracy of D-dimer test as regards the final diagnosis by CT pulmonary angiography were 100%, 19.4%, and 57% respectively. Its NPV was 100% and its PPV was 51.9%. **CONCLUSION:** D-dimer exhibited a high sensitivity but a low specificity. No significant difference in the mean D-dimer levels of patients with positive and negative CTPA results. Lower limit threshold of 300 was similar to the results of D-dimer ( $>500$ ) showing a high sensitivity 96.3% but low specificity 29.0%. Known cut off value of D-dimer ( $>246$ ) also showed high sensitivity of 100% but low specificity of 19.4%.

### Thyroid Imaging Reporting and Data System (TIRADS) in Stratifying Risk of Thyroid Malignancy at The Medical City

3rd Place, Philippine College of Radiology Research Contest, Poster Presentation  
*Renncee A. Oncogo, MD*  
*The Medical City*

#### ABSTRACT

**OBJECTIVE:** To determine the accuracy of Thyroid Image Reporting and Data System in detecting thyroid malignancy, determine risk of malignancy in each category and ultrasound characteristics associated with malignancy. **METHODOLOGY:** This is a retrospective cross-sectional study involving patients who underwent ultrasound, thyroid fine needle aspiration biopsy and thyroidectomy at The Medical City from January 2014 to December 2015. Ultrasound reports were retrieved and reviewed by two radiologists on separate occasions who were blinded with the cytopathology and histopathology results. The histopathology reports were correlated with ultrasound features to determine features associated with malignancy. Stata SE 12 was used for data analysis. TIRADS sensitivity, specificity, positive predictive values and negative predictive values and accuracy were calculated. **RESULTS:** 149 patients with thyroid nodules were included. Solid composition is the ultrasound feature predictive of malignancy with adjusted OR 4.912 (95% CI 1.3257 to 18.2011,  $p = 0.017$ ). The risk of malignancy for TIRADS categories 3, 4a, 4b, 4c and 5 were 12.50%, 12.82%, 26.19%, 53.70% and 66.67%, respectively. The Crude OR (95% CI) for TIRADS 4a, 4b, 4c and 5 were 1.03 (0.10 to 10.23), 2.48 (0.27 to 22.54), 8.12 (0.93 to 70.59)

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and 14.0 (0.94 to 207.60), respectively. The sensitivity, specificity, PPV, NPV and accuracy of TIRADS in relation to surgical histopathology report were 98.00%, 7.07%, 34.75%, 87.50%, and 37.58% respectively in TIRADS categories 4 and 5. **CONCLUSION:** This study showed that solid nodule was the ultrasound feature predictive of thyroid malignancy. Higher TIRADS classification is associated with higher risk of thyroid malignancy. TIRADS is a sensitive classification in recognizing patients with thyroid cancer.

### Evaluation on the Effectiveness of Audio-Visual Briefing in Reducing Anxiety/Depression in Patients Undergoing Breast, Transvaginal and Scrotal Ultrasound Procedures

Consolation Prize, Philippine College of Radiology Research Contest, Poster Presentation  
*Sherwyn P. Nueva-Lim, MD*  
*Southern Philippines Medical Center*

#### ABSTRACT

**OBJECTIVES:** To assess the level of distress in patients awaiting breast, transvaginal and scrotal ultrasound procedures using additional audio-visual presentation versus adapted verbal pre-procedural briefing only. **METHOD:** This study is a randomized clinical trial performed at the Department of Radiological Imaging Sciences which included all patients referred for breast, transvaginal and scrotal ultrasound who gave their consent from period of February to April 2016. They were randomly selected as Group A and Group B, with half of the group undergoing the adapted verbal pre-procedural briefing and other half received an additional audio-visual presentation. The hospital anxiety and depression scale were used to compare two psychological dysfunctions (anxiety and depression) between the two groups. **RESULTS:** 69 participants responded to the three month period survey and were categorized into two groups. Group A (32) respondents received verbal pre-procedural information while group B (37) respondents received an additional audio-visual presentation prior to ultrasound examination. Patients awaiting transvaginal ultrasound examination reported significantly higher baseline level of anxiety (14, 54%). Overall depressive mood level among groups showed significantly increased in patients awaiting breast ultrasound examination. Patients waiting for breast and scrotal ultrasound examinations revealed a significant improvement on the anxiety level after additional audio-visual presentation was introduced. However, no significant overall improvement was depicted on level of depression after audio-visual presentation intervention in patients for transvaginal, scrotal and breast ultrasound examinations in both groups. **CONCLUSION:** Adequate knowledge and proper pre-procedural instructions has a substantial effect on lowering anxiety related to ultrasound examination particularly on breast and scrotal scan, additional audio-visual presentation as another source of information also plays a significant role in reducing anxiety.

### The Role of Non-Steroidal Containing Nasal Decongestants in the Image Quality of Patients Referred for Paranasal Sinuses CT Scan Imaging

Consolation Prize, Philippine College of Radiology Research Contest, Poster Presentation  
*Namraida M. Sharif, MD; Maria Theresa T. Sanchez, MD; Ronald J. De Castro, MD*  
*Southern Philippines Medical Center*

#### ABSTRACT

**BACKGROUND:** The purpose of radiological imaging in inflammatory lesions in the nasal cavity and paranasal sinuses is to confirm the diagnosis, characterize the extent and localization of the disease, as well as to described anatomical variants. Inflammatory lesions in the nasal cavity and paranasal sinus comprises a spectrum of disease and imaging plays a key role in the diagnostic evaluation, choice of treatment and surgical planning. **OBJECTIVES:** The study determined whether the secretions in the paranasal sinuses after application of non-steroidal nasal decongestants has any effect on the paranasal sinus CT images in patients with nasal polyposis and sinusitis which may result in misdiagnosis or over diagnosis in radiological evaluation of sinusitis. **METHODOLOGY:** 91 adult patients diagnosed with sinusitis and nasal polyposis underwent PNS CT scan. Each patient was scanned twice: pre- and post-giving of non-steroidal nasal decongestant 30 minutes prior to PNS CT scanning. The images were reviewed by three radiologists. Wilcoxon test was used as the test of significance for the images acquired. **RESULTS:** This study showed high significant difference in the scores for the diagnostic image quality and anatomical structure assessments between pre- and post-nasal decongestion showing a p-value of infinity. The calculated coefficient of Variance for the assessment of the pathologic structures between the first and second reviewer for both protocols were 6.20% and 7.00%, respectively. The calculated CoV between the first and third reviewers were 8.00% and 10.40%, respectively. And between second and third reviewers were 7.00% and 9.40% for both protocols. These showed highly significant improvements of the PNS CT scan in terms of clearing of opacified sinuses comparing the pre- nasal decongestion and the post- nasal application of decongestants.

### Computed Tomography Utilization at the Emergency Department of Corazon Locsin Montelibano Memorial Regional Hospital

Philippine College of Radiology Research Contest, Poster Presentation  
*Zinotchka G. Ilejay, MD; Cherie Grace M. Quinking, MD*  
*Corazon Locsin Montelibano Memorial Regional Hospital*

#### ABSTRACT

**INTRODUCTION:** There has been a rising trend in the rate of CT utilization worldwide raising concerns about appropriate use by emergency department (ED) physicians and its potential risks. The following are the objectives of the study: (1) to characterize the utilization rate of cranial CT and abdomen-pelvis CT, (2) to describe the demographic profile and

## POSTER PRESENTATION

Clinical indications of the patients undergoing CT and (3) to describe the appropriateness of the CT requests. **METHODS:** This cross-sectional study was conducted at CLMMRH from 2012 to 2016. **RESULTS:** The results revealed an increase in the cranial CT utilization rate during the first four years of the study which was attributed to the availability of the CT scan and other benefits. A shift in the trend occurred in 2016 where a decline from a utilization rate of 10.3 in 2015 to 6.3 in 2016 was observed which may be due to the increase in the ED consults in 2016 by 69.8% from the previous year while the cranial CT requests remained almost the same, attributed to recurrent CT machine malfunction from 2015 to 2016 and implementation of the No Balance Billing Policy in 2015. The departments with the most cranial CT requests at the ED in descending order are: Department of Internal Medicine (53.7%); Department of General Surgery (37.4%), Department of Emergency Medicine (8.2%), Department of Otorhinolaryngology-Head and Neck Surgery (0.5%) and Department of Orthopedics and Traumatology (0.2%). The top three most common clinical indications for cranial CT at the ED are the following: head trauma (38.8%), clinically suspected stroke (38.1%) and clinically suspected parenchymal hemorrhage (11.6%). **DISCUSSION:** Taking into account the increase in ED consults over time and the common clinical indications for cranial CT being head trauma and cerebrovascular disease, the need to expedite these cases at the ED is clearly warranted. **CONCLUSION:** Overall, the rate of CT utilization at the ED of CLMMRH has been increasing over the five-year period. Concerns regarding radiation exposure, contrast reaction and contrast-induced nephropathy are clearly valid and may in part be addressed by determining radiologic appropriateness - which is a complicated process that involves good decision-making from the ED doctor. Radiologists also play a role in such decision-making at the ED.

### **Correlation between Megitt-Wagner Classification of Diabetic Foot and Doppler Ultrasound Findings at the Southern Philippines Medical Center: A Retrospective Study**

Philippine College of Radiology Research Contest, Poster Presentation  
*Cosi F. Rando-Imbang, MD; Winston G. Barcenas, MD*  
*Southern Philippines Medical Center*

#### **ABSTRACT**

**PURPOSE:** The aim of this study was to determine the expected Doppler ultrasound findings of Diabetic foot which was incorporated into the clinical profile and laboratory data, and to establish baseline features on Doppler ultrasound scanning that corresponded to the different grades of Diabetic foot using the Meggit-Wagner classification. This study was also conducted to determine which among the lower extremity arteries was mostly affected by the disease process. **MATERIALS AND METHODS:** This is a retrospective cross-sectional study conducted at the Department of Radiological and Imaging Sciences, Southern Philippines Medical Center, Davao City. Patients

who were diagnosed with Diabetic foot during the study period of January 2012 to December 2016 from the outpatient departments of Orthopedics, Family Medicine and Internal Medicine and admitted at the wards of Southern Philippines Medical Center were classified according to Meggit-Wagner Classification. Patients seen were given requests for fasting blood sugar and HbA1c, and Doppler ultrasound. Doppler scanning were scheduled at the ultrasound section of the Department of Radiological and Imaging Sciences and performed during the hospital stay or on an OPD basis. **RESULTS:** The Doppler ultrasound findings in the lower extremity arteries of Diabetic foot patients were plaque formation, luminal narrowing, flow disturbances and waveform pattern. Peak systolic velocity in every artery was also reported. These findings were classified from mild to severe form and correlated to the Meggit-Wagner Classification which showed an affirmative outcome. **CONCLUSION:** This study shows that Doppler ultrasound had a high yield in depicting abnormalities in patients with diabetic foot and was able to establish the baseline features on the different grades of Diabetic foot using Meggit-Wagner classification. This study also showed that with increasing grade of Diabetic foot using Meggit-Wagner classification, the Doppler Ultrasound findings also increased in severity such as abnormally high peak systolic velocity, severe plaque formation, total occlusion of the lumen, turbulent to zero flow disturbances and monophasic to no waveform pattern primarily affecting the posterior tibial artery, followed by the dorsalis pedis and anterior tibial arteries.

### **Volume Quantification of 2/3Sh Formula and ABC/2 Technique for Epidural Hematoma: A Retrospective Study**

Philippine College of Radiology Research Contest, Poster Presentation  
*Omar Sharizz B. Dumama, MD*  
*East Avenue Medical Center*

## INTERESTING CASES

### **Nondysraphic Intradural Spinal Lipomata with Posterior Fossa Extension in a 17-month Old Male: Manifestations on Computed Tomography and Magnetic Resonance Imaging** *Aletheia Cristina R. Joaquin, MD; Romelito Jose G. Galsim, MD* *University of the Philippines - Philippine General Hospital*

#### **ABSTRACT**

Nondysraphic intradural spinal lipoma is a benign spinal canal tumor which has been reported to comprise less than 1% of spinal cord neoplasms. We report a case of a 17-month old male noted to have gradually-enlarging soft tissue swelling over the nape and left temporal region since birth. The patient had spastic extremities and exhibited preferential movement of the left upper extremity. On CT and MRI, a large, intradural, fat-attenuating mass with intramedullary and extramedullary components was seen extending from the posterior fossa at the cordomedullary junction to the level of the T12 to L1 vertebrae. Two smaller intradural, extramedullary, fat-attenuating foci were also seen at the level of the lumbar vertebrae. An extracalvarial lipoma was also noted. Symptomatic intradural spinal lipomas are managed by timely spinal decompression, which has been documented to result in partial improvement of neurologic symptoms.

### **Imaging Features of Epigastric Parasitic Twinning: Case Report**

*Julian A. Santos, MD; Nonette A. Cupino, MD*

*University of the Philippines - Philippine General Hospital*

#### **ABSTRACT**

Parasitic twinning is a rare form of conjoined twinning in which an underdeveloped twin (parasite) is attached to a well-formed twin (autosite), varying in location and degrees of union which occurs in approximately 1 in 1-2 million live births. We report a case of a newborn male who presented with a mass of tissue and four rudimentary supernumerary extremities arising from the anterior lower thorax and epigastrium. Multimodality radiologic imaging was performed on the patient in order to aid in surgical planning, comprising of radiographs, ultrasound, and computed tomography. Excision of the parasite was performed and the autosite tolerated the procedure well and was sent home. Post-operatively, pathologic findings were compared with the imaging findings. Imaging is essential in delineating the anatomic abnormalities between parasitic twins, including extent of union as well as potentially life-threatening conditions such as complex congenital heart disease. Information from the imaging findings would aid the clinicians in planning for the medical and surgical management for the patient, which would ultimately determine the prognosis of the patient.

### **Arteriovenous Malformation of the Pancreas as a Rare Cause of Recurrent Upper Gastrointestinal Bleed**

*Ma. Isabella C. Pamintuan, MD; Eileen Grace G. Tiu, MD;*  
*Timothy Joseph S. Orillaza, MD; Romelito Jose G. Galsim, MD*  
*The Medical City*

#### **ABSTRACT**

Arteriovenous malformations (AVMs) are vascular anomalies composed of a nidus of vessels wherein blood flows directly from arteries to veins with no intervening capillary bed. When found in the pancreas, these may be asymptomatic but in some cases is associated with anemia when hemorrhage of the AVM occurs. The pancreas is among the rarest sites for gastrointestinal AVMs, found in only 0.9% of all gastrointestinal AVMs. However, it has a high inherent risk for fatal hemorrhaging, hence the need for timely and accurate diagnosis for

this rare cause of upper gastrointestinal bleeding, achieved by appropriate imaging examinations. This case demonstrates the diagnosis and treatment of pancreatic AVM in a 60 year old patient with a four year history of recurrent melena. CT scans as well as celiac and mesenteric angiography revealed an arteriovenous malformation involving the head and body of the pancreas. The bleeding was managed with partial embolization of the feeding vessels using ethylene vinyl alcohol copolymer (EVOH, Onyx<sup>®</sup>) and polyvinyl alcohol (PVA) particles. Complete resolution of symptoms was demonstrated until 11 months post-procedure.

### **Conradi-Hunermann-Happle Syndrome**

*Marc Kristoffer T. Hidalgo, MD*

*Quezon City General Hospital*

#### **ABSTRACT**

We present a case of Conradi-Hunermann-Happle Syndrome, an autoimmune chromosomal disorder characterized by skeletal malformations, skin disorders, and ophthalmologic abnormalities most frequently affecting females. The disease is caused by a mutation in the emopamil-binding protein gene occurring randomly as an inherited X-linked dominant trait often apparent at birth. The global prevalence rate of the condition affects less than 1 per 400,000 live births. Due to paucity of peer reviewed studies and rarity of the disease in the Philippines, its incidence rate is rarely documented. A female newborn was delivered by cesarean section to a 29 year-old G3P3(3003) with unremarkable maternal history. Diagnosis was made in correlation with clinical and radiological findings. She was managed symptomatically through a multidisciplinary approach in improving the patient's quality of life since there is currently no recognized medical cure for CDPX2. In this report, we stress the importance of imaging modalities and correlation with clinical findings in the diagnosis of CDPX2.

### **Julie's Hot Buns: Could it be Multiple System Atrophy?**

*Kamille S. Comilang, MD*

*Davao Doctors Hospital*

#### **ABSTRACT**

Multiple System Atrophy is a rare and fatal neurodegenerative disorder with features of progressive ataxia, parkinsonism, and autonomic failure in any combination. Its clinical manifestations reflect underlying olivopontocerebellar atrophy, central autonomic and striatonigral degeneration. The cerebellar variant of this disease pertains to cerebellar ataxia as the dominant clinical picture. The number of published reports about Multiple System Atrophy in the Philippines is limited. This is a case of a 52-year-old Filipino female with a three-year history of gait instability and slurring of speech. She had no known comorbidities and had unremarkable family history. Two cranial MRI taken early in her disease were reported as negative and she was initially managed as a case of stroke. Progression of her symptoms with new onset of urinary incontinence prompted a third cranial MRI, which revealed pontine and cerebellar atrophy, abnormal hyperintensity in the middle cerebellar peduncles, and a cruciform hyperintensity in the pons or the "hot cross bun sign" in T2WI. These findings suggest the Cerebellar Type of Multiple System Atrophy. Progression of this disorder is relatively rapid with no effective disease-modifying therapy. Accurate diagnosis as early as possible is important not only for patient management but also for the development of new therapeutic, social, and lifestyle strategies.

## INTERESTING CASES

### **Tenacious Tumors of the Thorax: A Case of a Recurrent Mediastinal Solitary Fibrous Tumor With Extrathoracic Metastasis**

*Angela Krista V Pedroso, MD  
St. Luke's Medical Center - QC*

#### **ABSTRACT**

Solitary fibrous tumors (SFTs) are rare mesenchymal neoplasms that frequently arise from the thorax but may also arise elsewhere in the body. SFTs are slow-growing tumors. Surgical excision usually results in complete cure and extrathoracic metastases are rare. This paper presents a 53-year-old Filipino male with a long-standing history of gradually enlarging left anterior mediastinal mass, previously diagnosed as a thymoma on fine needle aspiration biopsy. Surgical excision of the mediastinal mass showed histopathologic evidence of SFT. A few years later, patient presented with cough and work-up revealed a right-sided mediastinal mass which was excised and proven to be malignant solitary fibrous tumor. There was also note of a left upper extremity mass which was also histologically proven to be solitary fibrous tumor, likely from extrathoracic metastatic disease. This case demonstrates the multimodality imaging findings correlated with biopsy-proven malignant SFT. It also demonstrates the recurrent and aggressive behavior of mediastinal SFTs despite surgical resection and adjuvant radiotherapy, as well as unusual location of distant metastasis to the left upper extremity.

autosomal dominant disorder characterized by the development of benign and malignant tumors involving various organ systems. It is caused by either a mutation or inactivation of a suppressor gene located in chromosome 3. Early detection is imperative to provide optimal management to these various tumors and their accompanying complications. Imaging plays an important role and the task of the radiologist is to recognize the syndromic association of these VHL-related lesions. Management of such cases should be multidisciplinary. Strict surveillance is advised and follow-up must be lifelong.

### **Double Trouble: A Case Report Of Osteogenesis Imperfecta In Twins**

*Monique M. Inciong MD  
Ospital ng Makati*

#### **ABSTRACT**

Osteogenesis imperfecta (OI) is a rare genetic bone disease in the Philippines. It is also known as Brittle Bone Disease or "Lobstein syndrome". Obtaining a precise diagnosis of osteogenesis imperfecta prenatally through ultrasound diagnosis can be challenging, but can be beneficial to the patient and their families. This is a unique case of osteogenesis imperfecta in dizygotic, diamniotic twins. They both presented with short femur intrauterine and on further evaluation upon birth, more bone defects were seen in their radiograph study. Postnatal examination and bone radiography confirmed the diagnosis of OI. To date, literature mentions only a few cases regarding OI in twins. Zeitoun et al in 1962, presented female siblings with congenital osteogenesis imperfecta, one living to the age of 5 months and the other to approximately 5 ½ months.

### **Multi-Organ Manifestations of Von Hippel Lindau Syndrome: A Case Report**

*Mark Joseph P. Sibal, MD  
National Kidney and Transplant Institute*

#### **ABSTRACT**

A 29-year old Filipino female presented with a two-month history of vague abdominal pain associated with occasional vomiting and headache. Initial ultrasound findings show an enlarged pancreas with innumerable cysts replacing the entire parenchyma and multiple heterogeneous renal masses. Further work-up revealed avidly enhancing vascular lesions within the cerebellum and the spinal cord, consistent with hemangioblastoma. With an unremarkable medical and surgical history, von Hippel-Lindau syndrome was considered based on the presence of the characteristic VHL-related tumors. VHL disease is a rare

## INTERNATIONALLY PRESENTED PAPERS (2019)

### Oral Presentation

#### **Predictors for Refractoriness and Survival after Transarterial Chemoembolization among Hepatocellular Cancer Patients: Outcomes from a Southeast Asian Cohort**

Rudolf V. Kuhn, MD; Glenn Marc G. Ignacio, MD; Jade D. Jamias, MD  
National Kidney and Transplant Institute

Oral Presentation at the European Congress of Radiology (ECR) 2019, February 27- March 03, 2019, Vienna, Austria

#### **Are Academic Involvements of Radiology Trainees in Pediatrics Enough? Preliminary Results of a Global Perspective**

Joanna Marie D. Choa, MD<sup>1</sup>; Federica Vernuccio, MD; Dina Haroun, MD; Estefania Terrazas Torres, MD; Bayarbaatar Bold, MD; Monika Arzanauskaitė, MD

<sup>1</sup>St. Luke's Medical Center-Global City

Silver Prize Award for Best Oral Presentation, Oral Presentation, 19th Annual Meeting of the Asian and Oceanic Society of Pediatric Radiology (AOSPR), September 26-28, 2019, Seoul, South Korea

### Poster Presentation

#### **Covered Stent and Angular Vein Compression for the Treatment of Direct Type of CCF**

Cindy Sotalbo MD, Renato Carlos, MD

University of the Philippines – Philippine General Hospital

APSCVIR 14th Scientific Meeting, Bali International Convention Centre Display, Bali, Indonesia, February 21-24, 2019

#### **Adenoid Cystic Carcinoma of the Female Breast: A Case Report**

Ylanan, A., MD; Calaguas, MJ, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, 3rd Federation of Asian Organizations for Radiation Oncology Meeting, September 6-9, 2019

#### **Adenoid Cystic Carcinoma of the Right Lacrimal Gland Treated with Eye Sparing Surgery Using IMRT**

Callueng JM, MD; Cañal JP, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, 3rd Federation of Asian Organizations for Radiation Oncology Meeting, September 6-9, 2019

#### **Should Pregnancy Test be Done in Women of Child-Bearing Age Prior to Radiation Therapy? A Literature Review**

Cruz-Lim, EM., MD; Cupino, N, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, 3rd Federation of Asian Organizations for Radiation Oncology Meeting, September 6-9, 2019

#### **Krabbe Disease in a 6-month Old Male Presenting with Neurodevelopmental Regression and Psychomotor Delay: A Case Report**

Viterbo G, MD; Camacho A, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, Asian and Oceanic Society for Pediatric Radiology, September 21-24, 2019

#### **Beneath the Unusual: A Case of Thoracic Neuroblastoma**

John Clem Ravago, MD

St. Luke's Medical Center - Global City

Poster Presentation, 19th Annual Scientific Meeting of Asian and Oceanic Society for Paediatric Radiology, September 26-28, 2019, Seoul, South Korea

#### **Caudal Regression Syndrome: A Multimodality Review of Imaging Features**

Agatha Krystie G. Chaves, MD<sup>1</sup>; Mariaem M. Andres, MD<sup>2</sup>

<sup>1</sup>St. Luke's Medical Center-Global City, <sup>2</sup>St. Luke's Medical Center-Quezon City

Poster Presentation, 19th Annual Scientific Meeting of Asian and Oceanic Society for Paediatric Radiology, September 26-28, 2019, Seoul, South Korea

#### **Chondrosarcoma in a 15-year Old Male Patient with Ollier's Disease**

David P. Nagtalon, MD; Nathan David P. Concepcion, MD

St. Luke's Medical Center, Global City

Poster Presentation, 19th Annual Scientific Meeting of Asian and Oceanic Society for Paediatric Radiology, September 26-28, 2019, Seoul, South Korea

#### **Diagnostic Accuracy of Multislice Thoracic CT Angiography in the Detection of Atrial Septal Defect, Ventricular Septal Defect and Patent Ductus Arteriosus Assessed with Conventional Cardiac Catheterization and/or Cardiac Surgery as Gold Standards**

Eric Gerard C. Maglaya, MD<sup>1</sup>; Bernard F. Laya, MD<sup>1,2</sup>; Nathan David P. Concepcion, MD<sup>1,2</sup>; Mariaem M. Andres, MD<sup>1,2</sup>

<sup>1</sup>St. Luke's Medical Center - Quezon City, <sup>2</sup>St. Luke's Medical Center - Global City  
Poster Presentation, 19th Annual Meeting of the Asian and Oceanic Society of

Pediatric Radiology (AOSPR), September 26-28, 2019, Seoul, South Korea

#### **Exogenous Lipoid Pneumonia: A Case Series and Review of Radiologic Findings in Infants**

Mary Ronah B. Cristal, MD<sup>1</sup>; Nathan David P. Concepcion, MD<sup>1,2</sup>

<sup>1</sup>St. Luke's Medical Center - Quezon City, <sup>2</sup>St. Luke's Medical Center - Global City

Poster Presentation, 19th Annual Meeting of the Asian and Oceanic Society of Pediatric Radiology (AOSPR), September 26-28, 2019, Seoul, South Korea

#### **Imaging Spectrum and Temporal Evolution of Necrotizing Pneumonia among Children: A Case-Series and Review of Literature**

Leo Neil L. Apale, MD<sup>1</sup>; Nathan David P. Concepcion, MD<sup>1,2</sup>

<sup>1</sup>St. Luke's Medical Center - Quezon City, <sup>2</sup>St. Luke's Medical Center - Global City

Poster Presentation, 19th Annual Meeting of the Asian and Oceanic Society of Pediatric Radiology (AOSPR), September 26-28, 2019, Seoul, South Korea

#### **Pancreatoblastoma in an Ectopic Pancreatic Rest: A Case Report**

Jan Dexter P. Ferrer, MD<sup>1</sup>; Nathan David P. Concepcion, MD<sup>1,2</sup>; Krisette Y. Bautista, MD<sup>3</sup>

<sup>1</sup>St. Luke's Medical Center - Quezon City, <sup>2</sup>St. Luke's Medical Center - Global City, Taguig City, <sup>3</sup>National Kidney and Transplant Institute

Poster Presentation, 19th Annual Meeting of the Asian and Oceanic Society of Pediatric Radiology (AOSPR), September 26-28, 2019, Seoul, South Korea

#### **A Prospective Experimental Study on the Extent in Size and Type of Lead Gown Damage and Associated Radiation Dose Risk at St. Luke's Medical Center - Global City**

Rafael Luis T. Mercado, MD; Nathan David P. Concepcion, MD; Adrian Caraan

St. Luke's Medical Center - Global City

Poster Presentation, 19th Annual Scientific Meeting of Asian and Oceanic Society for Paediatric Radiology, September 26-28, 2019, Seoul, South Korea

#### **A Rare Case of Scrotal Arteriovenous Malformation: Successful Transcatheter Angioembolization and Multidisciplinary Treatment Approach**

HR Panizales, MD; DC Villanueva, MD; AG Tingtungco, MD; ZS Bernardo, MD

St. Luke's Medical Center - Global City

Poster Presentation, 6th Asia Pacific Congress of Interventional Oncology (APCIO) 2019, October 3-5, 2019, Malaysia

#### **Dermatofibrosarcoma Protuberans of the Upper Eyelid Treated with Surface Mould High-Dose-Rate Brachytherapy**

Jamora K, MD; Hizon V, MD; Cereno R, MD; Inocencio E, MD; Ceballos M, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, 4<sup>th</sup> Federation of Asian Organizations for Radiation Oncology (FARO) Meeting 2019, November 14-16, 2019, China

Poster Presentation, European Society for Radiotherapy and Oncology (ESTRO) Meets Asia 2019, December 6-8, 2019, Singapore

#### **Neoadjuvant Chemoradiation Therapy for Laryngeal Synovial Sarcoma: Management of a Rare Case**

Cruz-Lim, EM, MD; Cañal JP, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, European Society for Radiotherapy and Oncology (ESTRO) Meets Asia 2019, December 6-8, 2019, Singapore

#### **Possible Role of Radiotherapy in the Management of Orbital Solitary Fibrous Tumors: A Case Series**

Cereno REP, MD; Canal JPA, MD; Ranche FKT, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, Best of ASCO Asia 2019, July 5-6, 2019, Singapore

Poster Presentation, European Society for Radiotherapy and Oncology (ESTRO) Meets Asia 2019, December 6-8, 2019, Singapore

#### **Practice Patterns in Brachytherapy for Cervical Cancer in the Philippines: A National Survey**

Cereno REP, MD; Canal JPA, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, Best of ASCO Asia 2019, July 5-6, 2019, Singapore

Poster Presentation, 4<sup>th</sup> Federation of Asian Organizations for Radiation Oncology (FARO) Meeting 2019, November 14-16, 2019, China

Poster Presentation, European Society for Radiotherapy and Oncology (ESTRO) Meets Asia 2019, December 6-8, 2019, Singapore

#### **Toxicities and Recurrences after Co-60 High-Dose-Rate Brachytherapy for Cervical Cancer in a Tertiary Hospital in the Philippines**

Cereno REP, MD; Yap B, Chavez LL, MD; Germar MJ, MD; Eala M, MD; Fragante EJ, MD

University of the Philippines – Philippine General Hospital

Poster Presentation, European Society for Radiotherapy and Oncology (ESTRO) Meets Asia 2019, December 6-8, 2019, Singapore

## INTERNATIONALLY PRESENTED PAPERS (2018)

### Oral Presentation

#### Follow-up Outcome of BI-RADS Category 3 Solid Masses Identified on Screening and Diagnostic Breast Ultrasound

Joanna Marie D. Choa<sup>1</sup>, MD; Anna Lyn C. Egwolf, MD<sup>1,2</sup>

<sup>1</sup>St. Luke's Medical Center-Global City, <sup>2</sup>University of Santo Tomas Hospital  
Oral Presentation, 13th Congress of Asian Federation of Societies for Ultrasound in Medicine and Biology (AFSUMB), May 23-26, 2018, COEX, Seoul, South Korea

Oral Presentation, 104th Annual Convention of the Radiologic Society of North America (RSNA), November 25-30, 2018, McCormick Place, Chicago, Illinois, USA

### Poster Presentation

#### Correlation between Cranial Magnetic Resonance Imaging and Electroencephalogram Findings among Patients Presenting with Seizure

Juan Miguel L. Manalo, MD<sup>1</sup>; Joanna Marie D. Choa, MD<sup>2</sup>

<sup>1</sup>University of Santo Tomas Hospital, <sup>2</sup>St. Luke's Medical Center-Global City  
Poster Presentation, XXI Symposium Neuroradiologicum (21st World Congress of Neuroradiology), March 18-23, 2018, Taipei International Convention Center, Taipei, Taiwan

#### Correlation of Cerebral Catheter Angiogram Diagnosed Aneurysms with Pre-Angiogram Non-Contrast Enhanced Cranial CT Scans from 2004-2015

Cesar C. de Guzman Jr, MD; Jason S. Catibog, MD

University of the Philippines - Philippine General Hospital  
Poster Presentation, Asian Australasian Federation of Interventional and Therapeutic Neuroradiology (AAFITN), March 2018, Kota Kinabalu, Malaysia

#### Zebras and Horses: A Case Report of Misleading Posterior Fossa Lesions

Joanna Marie D. Choa, MD

St. Luke's Medical Center-Global City

Poster Presentation, XXI Symposium Neuroradiologicum (21st World Congress of Neuroradiology), March 18-23, 2018, Taipei International Convention Center, Taipei, Taiwan

#### Ultrasound of the Scalp Soft Tissue Mass Revealed More than What Was Expected: A Rare Intracranial Neoplasm

John Clem P. Ravago, MD; Anna Lyn Corneja-Egwolf, MD

St. Luke's Medical Center - Global City

Poster Presentation, 13th Congress of the Asian Federation of Societies for Ultrasound in Medicine and Biology (AFSUMB 2018) in conjunction with ACUCI 2018 and KSUM Open 2018, May 23-26, 2018, Coex in Seoul, Korea

#### Case Report: Fibromyxoma of the Maxillary Bone with Extension to the Pterygoid and Sphenoid Bone, A Rare Benign Neoplasm

N Patel, MD

St. Luke's Medical Center - Global City

Poster Presentation, 18th Asian Oceanic Society of Paediatric Radiology (AOSPR) and 16th Indian Society of Paediatric Radiology (ISPR), Sep 14 - 16, 2018, Chandigarh, India

#### Case Series: Posterior Reversible Encephalopathy Syndrome - A Misnomer. Atypical Imaging Manifestations in Pediatric Patients

N Patel, MD; B Laya, MD

St. Luke's Medical Center - Global City

Poster Presentation, 18th Asian Oceanic Society of Paediatric Radiology (AOSPR) and 16th Indian Society of Paediatric Radiology (ISPR), Sep 14 - 16, 2018, Chandigarh, India

#### Hirschsprung Disease in Patient with Crouzon Syndrome

Camille Joanne DC Galleguez, MD; Nathan David P. Concepcion, MD

St. Luke's Medical Center-Global City

Poster Presentation, 18th Asian Oceanic Society of Paediatric Radiology (AOSPR) and 16th Indian Society of Paediatric Radiology (ISPR), September 14 - 16, 2018, Chandigarh, India

#### Neuromyelitis Optica Spectrum Disorder in a 7-year Old

Camille Joanne DC Galleguez, MD; Nathan David P. Concepcion, MD

St. Luke's Medical Center - Global City

Poster Presentation, 18th Asian Oceanic Society of Paediatric Radiology (AOSPR) and 16th Indian Society of Paediatric Radiology (ISPR), September 14 - 16, 2018, Chandigarh, India

#### VACTERL Association: A Case Report

MMG Cariño, MD; N Patel, MD

St. Luke's Medical Center - Global City

Poster Presentation, 18th Asian Oceanic Society of Paediatric Radiology (AOSPR) and 16th Indian Society of Paediatric Radiology (ISPR), Sep 14 - 16, 2018, Chandigarh, India

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