INTRODUCTION:
Subscapularis (SSc) tendon tears are a well-established cause of shoulder pain that have only recently received attention in the scientific literature. Initially thought to be a rare entity, recent studies have noted as high as a 27% incidence of SSc tears associated with operative Supraspinatus (SSn) tendon tears. Tear patterns have been described in the acute setting, as well as with chronic, degenerative pathology. Through cadaveric dissections, Sakurai et al demonstrated degenerative changes evident in the subscapularis tendon, noting predominantly superior and partial thickness tearing of the tendon. Gerber et al also noted the co-incidence of biceps subluxation and subscapularis tendon tears while operating on supraspinatus tendon pathology. The combination of subscapularis and supraspinatus tendon tears, along with a diseased long head of the biceps suggests a larger biologic pathology than isolated attritional changes within a tendon.

In 1994, Goutallier et al first introduced the idea of a predictable pattern of pathology in the supraspinatus musculotendinous unit associated with full thickness tears of the tendon. With this information, a classification was described and subsequently correlated with surgical outcomes, chronicity and progression of rotator cuff pathology. Although the pathologic changes described were originally within the supraspinatus tendon, subsequent discussion of subscapularis and infraspinatus pathology have been based on the assumption of similar biologic manifestations. The subscapularis is structurally and functionally isolated from the rest of the rotator cuff muscles. It has a unique infrastructure comprised of four musculotendinous units, with only the proximal 1/3 of the common tendon intra-articular. There have been recent attempts to correlate radiologic findings to subscapularis pathology (cyst formation, biceps tendon) however, there have not been any studies demonstrating a predictable pattern of structural changes within the SSc muscle and associated pathology in the shoulder.

This study was designed as a retrospective observational study of the changes detected by MRI associated with full thickness subscapularis tendon tears. Our hypothesis was that a unique, predictable pattern of structural changes occur within the muscle of the subscapularis secondary to disruption of the musculotendinous unit. Also associated pathology within the shoulder joint in patients with SSc tears can be age and gender dependent.

METHODS
A database of MRI scans from Shields Health Care Group was searched for full thickness subscapularis tendon tears. The search parameters included the term “Subscapularis” within the impression of the official report, and a scan date between June of 2008 and May of 2009. Inclusion criteria for this study was the presence of a full thickness subscapularis tendon tear detectable by MRI, a complete series of T1 and T2 weighted axial, coronal and parasagittal images, and limited or no motion artifact. All image interpretations and measurements were made by a fellowship trained musculoskeletal radiologist and an orthopaedic sports fellow.

MRI imaging is performed with a 1.5T system (Espree; Siemens Medical Solutions, Erlangen, Germany). A flexible wraparound receive-only surface coil was utilized. Sequences included, axial gradient echo, axial proton density fat sat, coronal oblique proton density fat sat, coronal oblique T2, sagittal oblique T1 and sagittal oblique proton density fat sat weighted images. All sequences were available for the image analysis. Subscapularis tear were evaluated on sagittal and axial PDFT images. Sag T1 images were utilized for evaluation of muscle volume and fatty infiltration. CA ligament and RC interval synovitis were evaluated on sagittal images. Initial measurements included length of tendon tear in both the axial and parasagittal images which was added as a total tear size. The number of quadrants involved and the Goutallier scale was then determined via T1 weighted parasagittal images. Associated biceps tendon pathology was also recorded at the groove and articular surface. All data were statistically analyzed according to both age and gender.

RESULTS
Total number of patients included in the study is 49 (male = 33, female = 16). Patients age ≥ 55 (n=24) vs. ≤ 54 (n=25) had: average tear size 35mm vs. 19mm, Goutallier scale 2.7 vs. 0.8, and SSc muscle volume loss 25% vs. 5% (all p<0.001). See table 1. Patients <45 had no concomitant RC tears and no frank dislocation of the long head biceps tendon. Patients with dislocated (n=13) vs. normal biceps tendon (n=34) had: SSc tear size 37mm vs. 23 mm, muscle volume loss 28% vs. 9%, Goutallier scale 3 vs. 0.9, and age 66 vs. 49 years (all p<0.05). Patients with concomitant RC tears had: SSc tear size 32mm vs.17mm, Goutallier scale 2.3 vs. 0.6, and SSc muscle volume loss 21% vs. 3%, (all p<0.05).

All of the data were also analyzed comparing the male versus female population. Of significance, the Goutallier scale was higher in the female population 2.2 vs. the male population 1.4. (p<0.05) However, the average tear size, quadrant rating, and percent muscle volume loss were all very similar between the two gender groups. See table 2.

DISCUSSION
Increasing age, dislocated biceps tendon, and concomitant rotator cuff tears in patients with a full thickness Subscapularis tendon tears are associated with larger SSc tendon tear size, higher Goutallier scale, and increased SSc muscle volume loss. In terms of gender, the average SSc tear size, quadrant rating, and percent muscle volume loss are very similar, however, females tends to have a higher Goutallier scale within the SSc musculotendinous unit (p<0.05) when the tendon is torn.

REFERENCES