

Lateral Oblique Imaging in Haglund's deformity: a Retrospective Comparison to Determine Clinical Utility

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STATEMENT OF PURPOSE

Haglund's deformity is at times challenging to identify on traditional radiographs due to highly variable posterior calcaneal anatomy (Figure 1). The standard foot radiographic series' includes an AP image, found futile in this condition, a lateral image that can identify an enlarged posterior-superior calcaneal tuberosity, and a medial oblique image which evaluates the medial but not the lateral edge of the superior tuberosity. Calcaneal axial imaging is deficient at capturing the Haglund's deformity, not showing the superior aspect of the calcaneal tuberosity. We routinely incorporate a lateral oblique (LO) image or what we call the "Haglund's view" along with the traditional lateral image to evaluate the superior lateral aspect of the calcaneal tuberosity where the Haglund's bump is commonly present (Figure 2). This bump is commonly associated with soft tissue changes present on lateral oblique radiographs (Figure 3). Our Hypothesis is that the superior lateral bump seen on the LO radiograph is highly associated with but not exclusive to symptomatic Haglund's deformity when compared to a control group.

LITERATURE REVIEW

- In 2008 Singh et al. looked at 41 heels with diagnosis of Haglund's deformity. They observed that of all the radiographic angles parallel pitch lines and Chauveaux-Liet angle were the most sensitive measurements to the extent of 63.3% and 73%, respectively. It was observed that AP diameter of Achilles tendon ≥ 9 mm (95.77%), superficial tendo-Achilles bursa (81.69%) and ill defined retocalcaneal recess (85.91%) were the most common soft tissue radiological findings associated with posterior heel pain.
- In 2007 Lu et al. found no significant difference in the Phillip Fowler angle (PFA) of those with and without Haglund's syndrome. The PFA had a 94.6% false negative rate. There was no statistical significance when measuring parallel pitch lines (PPL) on symptomatic patients vs. the controls. 43.2% of the time PPL lines were falsely negative.
- In 2015 Bulstra et al. looked at 78 patients with symptomatic Haglund's deformity alongside 100 controls. They found no significant difference PFA, but did find significant difference in calcaneal pitch angle.

METHODOLOGY AND PROCEDURE

- Retrospective review of 75 sets of radiographs in 65 consecutive patients with symptomatic Haglund's deformity seen from 2016-2018. Patients were excluded if a posterior spur was present. The control group consisted of 30 random patients without Haglund's deformity on clinical exam who had xrays for other conditions.
- Traditional lateral and LO radiographs were evaluated to determine if Haglund's deformity was present or absent.
- The two subsets of patients were compared to determine if the superior lateral bump as seen on the LO radiograph is associated with Haglund's deformity or if this finding represents normal anatomy. Statistical significance was calculated using the t-test for two independent means.

Participants	Patients	Sets of Radiographs
Study Group	65	75
Controls	30	30
Gender	Total	Percentage
Males	24/65	36.9%
Females	41/65	63.1%
Side of Involvement		
Right	33/65	50.7%
Left	22/65	33.8%
Bilateral	10/65	15.4%
Variable	Average \pm SD	Range (min - max)
Age (Years)	48.8 \pm 17.0	10 to 76

Figure 1. Traditional Imaging Approach for Symptomatic Haglund's Deformity



(a) Lateral radiographs easily demonstrate retrocalcaneal spurs which are commonly associated with Haglund's deformity. (b,c) Isolated Haglund's deformity is more challenging to identify on imaging as shown here where the clinical appearance is more dramatic than the what is seen on the lateral image. Note soft tissue thickening in the lateral view.

Figure 2. Proposed Radiographic Series for Haglund's Deformity Includes a Lateral Oblique (LO) Radiograph



(a) Substantial Haglund's deformity is seen on clinical exam yet the (b) lateral view looks fairly unremarkable. (c) The lateral oblique (LO) radiograph shows a large superior lateral prominence but this view is not part of the 3 view standard xray series. This research intends to identify if this finding on LO imaging represents Haglund's deformity or is a normal finding.

Figure 3. Soft Tissue Thickening is Also Seen on Lateral Oblique radiograph



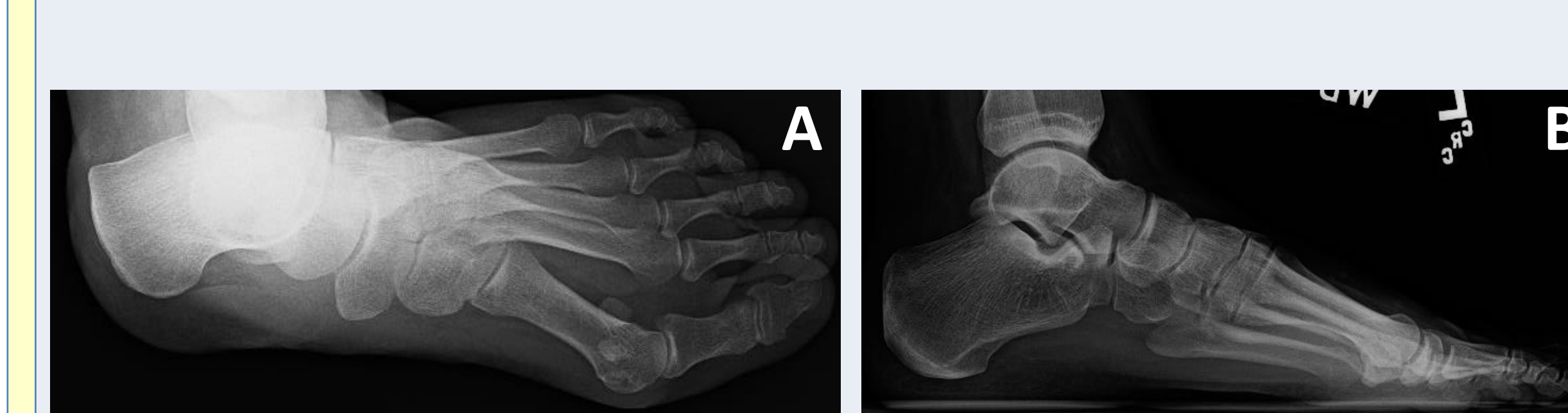
15 year old hockey player with bilateral Haglund's deformity. Lateral radiographs are normal while superior lateral prominence with dense soft tissue is evident on the LO radiographs.

Figure 4. Example Without Deformity on Lateral or LO Imaging



23/30 (80%) in the control group had (a) no Haglund's deformity on the lateral image and (b) no superior lateral bump on the LO image.

Figure 5. Example of Asymptomatic Deformity on LO Image



6/30 (20%) in the control group had a superior lateral bump on the (a) LO image. (b) 3 of these had no Haglund's bump on the lateral image and 3 others also had a Haglund's bump on the lateral image.

RESULTS

- 62/75 (82.6%) patients with symptomatic Haglund's deformity had a Haglund's bump on the lateral radiograph while 75/75 (100%) had visible deformity on the LO radiograph, a difference that was significant ($p = 0.004626$). The LO image had a Positive Predictive Value of 100%.
- 24/30 (80%) patients without clinical Haglund's deformity had no Haglund's bump on the Lateral or LO radiograph (Figure 4). 3/30 (10%) had visible deformity on both the Lateral and LO radiograph while 3/10 (10%) others had visible deformity on only LO (Figure 5), a difference that was not significant ($p = 0.01$). The LO image for the control group had a Negative Predictive Value of 89%.
- All patients with symptomatic Haglund's deformity had a positive LO radiograph compared to 6/30 in the control group (a difference that was significant ($p = 0.00001$)).

Table 2. Summary of Results

Study Group		
Clinical Diagnosis of Haglund's	75 Patients	
Haglund's on Lateral Image	62/75	82.6%
Haglund's on LO Image	75/75	100%
P Value =	Significant	.004626
Positive Predictive Value	100%	
Control Group		
Haglund's on Lat and LO Images	3/30	10%
Haglund's on LO image	6/30	20%
No Haglund's on Lat or LO Images	24/30	80%
P Value =	Significant	.00001
Negative Predictive Value	89%	

ANALYSIS & DISCUSSION

- The LO view is not routinely obtained for common foot and ankle conditions but is particularly useful for patients with posterior heel pain.
- These results confirm our hypothesis that the LO radiograph is an important diagnostic study in this condition which is why we consider it the "Haglund's view". While the superior lateral bump seen on the LO view is highly associated with symptomatic Haglund's deformity, it can be seen without clinical Haglund's deformity.
- Limitations of this study include the relatively small study and control groups and retrospective nature of the study. These results demonstrate the utility of this simple, inexpensive, and easily reproducible radiographic view. It also highlights the limitations of imaging modalities for Haglund's deformity. The addition of the LO view to the standard foot views allows for more complete evaluation of the posterior calcaneal anatomy in patients with posterior heel pain. We have also observed that intraoperative LO imaging is useful to ensure full Haglund's resection.

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