

## CMEARTICLE

## Clinics in diagnostic imaging (170)

Mohammad Taufik Bin Mohamed Shah<sup>1</sup>, MBBS, FRCR, Bak Siew Steven Wong<sup>1</sup>, MBChB, MMed



Fig. 1 Lateral left ankle radiograph.

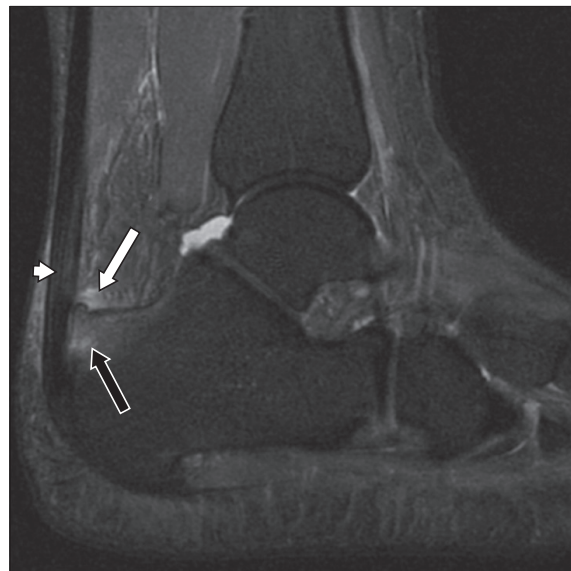


Fig. 2 Sagittal inversion-recovery MR image of the left ankle.

**CASE PRESENTATION**

A 30-year-old woman presented with a six-month history of left posterior heel pain. Physical examination revealed a tender, inflamed and indurated posterior heel with an associated visible

bony prominence on the posterosuperior aspect of the calcaneus. Lateral ankle radiography (Fig. 1) and subsequent magnetic resonance (MR) imaging (Fig. 2) of the left foot were performed. What do the images show?

<sup>1</sup>Department of Diagnostic Radiology, Singapore General Hospital, Singapore

**Correspondence:** Dr Wong Bak Siew Steven, Senior Consultant, Department of Diagnostic Radiology, Singapore General Hospital, Outram Road, Singapore 169608. steven.wong@singhealth.com.sg

## IMAGE INTERPRETATION

The lateral ankle radiograph (Fig. 1) shows prominent left posterosuperior calcaneal tuberosity (black arrow) and thickening of the distal Achilles tendon outline (white arrow). The MR image (Fig. 2) demonstrates high-signal inflammatory fluid in the retrocalcaneal bursa (white arrow), increased signal intensity and thickening of the Achilles tendon (arrowhead), and prominence of the posterosuperior calcaneal tuberosity (black arrow). The increased signal intensity of the posterosuperior calcaneal prominence is indicative of marrow oedema.

## DIAGNOSIS

Haglund's deformity.

## CLINICAL COURSE

The patient was prescribed a course of conservative management that included physiotherapy sessions, analgesics for pain relief and footwear modification. The symptoms persisted after six months and surgical therapy was offered. The patient underwent excision of the Haglund's deformity and retrocalcaneal bursa, as well as debridement of the inflamed Achilles tendon. She recovered well after surgery, without recurrence of symptoms.

## DISCUSSION

Haglund's deformity, a condition that was first described by Patrik Haglund in 1928, consists of a triad of retrocalcaneal bursitis, Achilles tendinosis and a posterosuperior calcaneal prominence.<sup>(1)</sup> Although the disease occurs in both genders, it has a female preponderance.<sup>(2)</sup> It usually affects younger patients, particularly those in their 20s and 30s.<sup>(3)</sup>

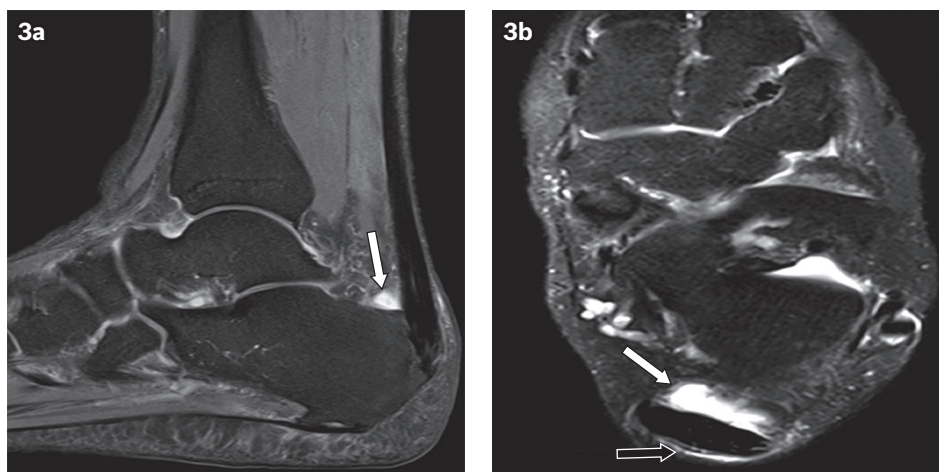
The posterosuperior calcaneal bony prominence, also called Haglund's disease, is due to an exostosis. Repetitive impingement between this prominence and the deep surface of the Achilles tendon, just above the level of its calcaneal insertion, incites inflammatory change in the tendon. A swollen and inflamed retrocalcaneal bursa that lies between the Achilles tendon and the posterior calcaneus contributes to the pain. Persistent and repetitive irritation leads to the formation and inflammation of

an adventitial bursa superficial to the Achilles tendon, which is also called the superficial retrocalcaneal bursa or retro-Achilles bursa (Figs. 3a & b).<sup>(2)</sup>

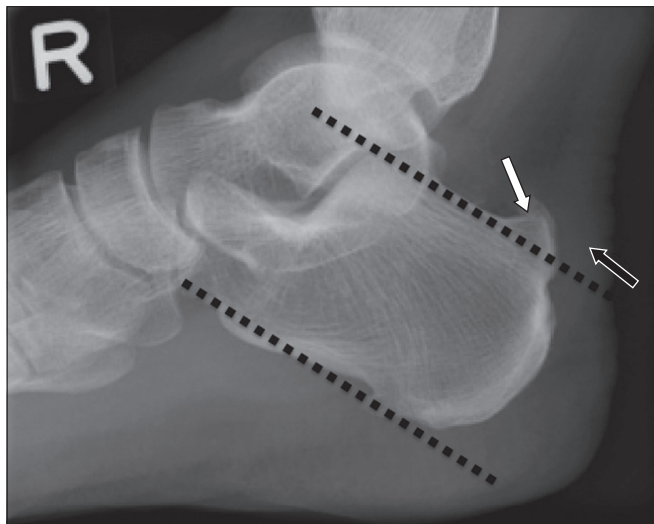
Most patients with posterior heel pain present with localised, painful swelling of soft tissue; some patients may present with a concurrent posterosuperior calcaneal prominence. They may report pain associated with uphill walking and chronic strenuous activity such as long-distance running. Such activities are often aggravated by pressure due to a tight heel counter from ill-fitting footwear or pumps, resulting in 'pump bumps'. Pain can also arise due to new or worn-out shoes, recent footwear adjustments, and/or an intensification in physical activity or workload.<sup>(2)</sup> On physical examination, patients may have a tender and erythematous posterosuperolateral heel prominence, usually from retrocalcaneal or sometimes adventitial bursitis. Passive dorsiflexion of the foot may elicit tenderness localised to the bursa or bony prominence. To detect the presence of concomitant tendinopathy, palpation should be performed to localise any area(s) of tenderness along the Achilles tendon; it also helps to confirm the presence of surrounding soft-tissue swelling. An enlarged and inflamed fluid-filled retrocalcaneal bursa can, at times, be felt by simultaneously palpating medially and laterally anterior to the Achilles tendon. More importantly, a 'squeeze test' should be carried out in patients with posterior heel pain to examine for the possibility of calcaneal stress fracture. This is done by applying moderate compression, using both palms, to the calcaneal tuberosity.<sup>(4)</sup> A stress fracture should be suspected when significant tenderness is elicited during this manoeuvre.

Haglund's deformity is generally thought to be a developmental condition and postulated to be associated with chronic calcaneal apophysitis experienced in childhood.<sup>(5)</sup> Structural factors implicated in its aetiology include, but are not limited to, a high-arched cavus foot and the presence of a varus heel.<sup>(6)</sup> A combination of these factors can affect foot dorsiflexion, make the heel more prominent and cause it to be more susceptible to increased pressure from shoe counters and tendons.<sup>(4)</sup>

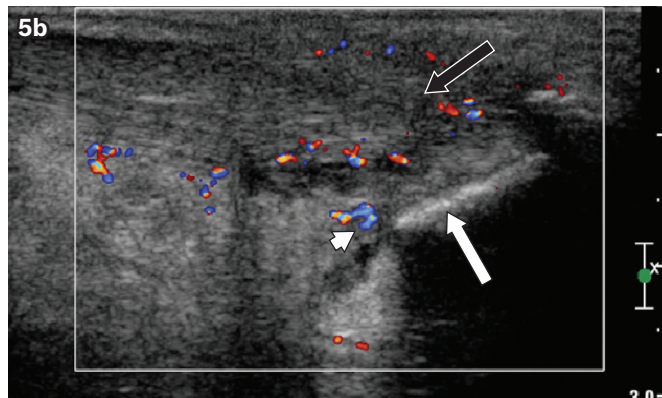
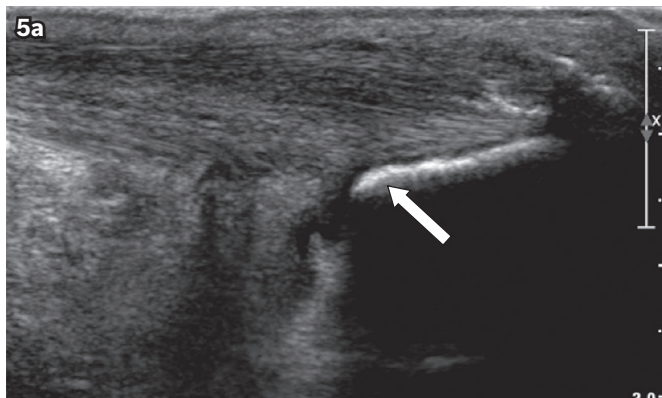
Radiologically, the condition is often initially assessed on plain radiography. Many radiographic parameters such as lines,



**Fig. 3** (a) Sagittal and (b) axial inversion-recovery MR images of the right ankle in a 36-year-old woman with Achilles tendinopathy show prominent retrocalcaneal bursal fluid (white arrows). (b) The presence of adventitial/superficial bursa fluid is also seen posterior to the Achilles tendon (black arrow).



**Fig. 4** Right ankle lateral radiograph of a 56-year-old man with hind foot pain shows parallel pitch lines (dotted lines). The bony projection (white arrow) above this line is considered abnormal. Thickening of the distal Achilles tendon is also seen (black arrow).

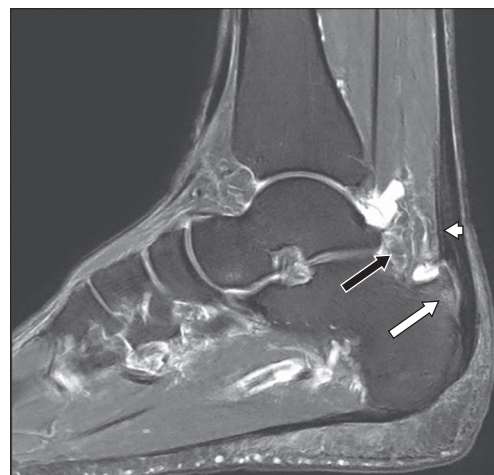


**Fig. 5** (a) Grey-scale and (b) colour Doppler US images of the left ankle (in longitudinal view) in a symptomatic 55-year-old woman with Haglund's deformity shows a prominent posterosuperior 'bump' represented by thick echogenic line (white arrows). There is thickening, decreased echogenicity and increased vascularity of the distal Achilles tendon, in keeping with tendinopathy (black arrow). The inflamed retrocalcaneal bursa is also demonstrated (arrowhead).

angles and soft-tissue measurements have been developed to evaluate the relationship among the calcaneal bony prominence, Achilles tendon and retrocalcaneal bursa, and to determine their correlation with Haglund's disease. These parameters, which are measured on weight-bearing lateral ankle radiography, include the parallel pitch lines, Steffensen and Evensen angle, Fowler-Philip angle (FP angle), calcaneal pitch angle (CP angle) and Chauveaux-Liet angle (CL angle). While no single measurement is completely predictive of the condition, a combination of measurements can increase its diagnostic probability. Singh et al suggested that both parallel pitch lines (Fig. 4) and the CL angle are reliable objective indicators of calcaneal bony deformities in patients with posterior heel pain, as they reflected accurate measurements of the dorsal tuberosity and calcaneal inclination.<sup>(7)</sup> Another study by Bulstra et al noted that only the CP angle measurement was found to be significantly larger in Haglund's disease, although this was only true for female patients.<sup>(8)</sup> Other studies by Lu et al and Flamiengo et al, using CP and FP angles, did not show any correlation between hind foot pain and radiographic abnormality, and therefore the angles were

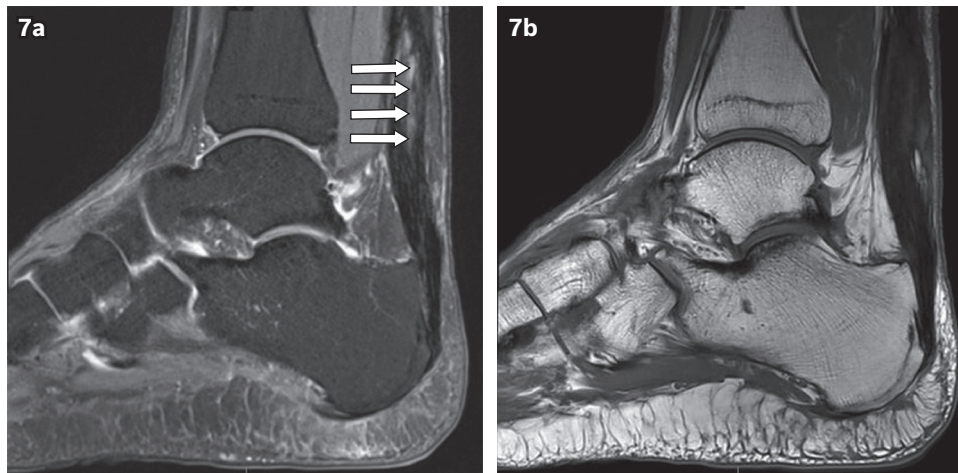
not helpful in making diagnostic and management decisions.<sup>(8)</sup> However, the presence of a poorly defined retrocalcaneal recess, a superficial retrocalcaneal (adventitial) bursa and an Achilles tendon outline anteroposterior measurement  $> 9$  mm were believed to be dependable indicators of soft-tissue involvement in patients with concurrent retrocalcaneal bursitis and Achilles tendinopathy.<sup>(7)</sup>

Ultrasonography (US) is another useful modality in the evaluation of Haglund's disease. It is fast, cheap, free from ionising radiation, and allows dynamic, real-time patient evaluation. A linear, high-frequency (e.g. 13-MHz) transducer is typically employed for examination of the retrocalcaneal area. US can show localised inflammatory changes in the overlying skin and subcutaneous tissues, demonstrate fluid within the retrocalcaneal bursa, and evaluate pathologic abnormalities of the distal Achilles tendon (Fig. 5).<sup>(9)</sup> In patients without Haglund's disease, US is useful in differentiating isolated bursitis from Achilles tendinopathy and can therefore guide appropriate treatment. US can reliably distinguish cystic masses from solid masses that may mimic Haglund's disease. It can also detect the presence of fluid

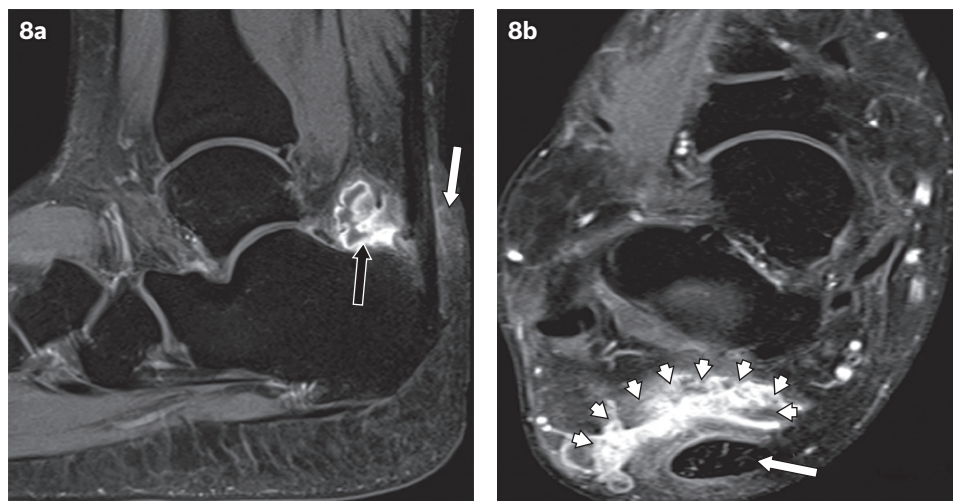


**Fig. 6** Sagittal inversion-recovery MR image of the right ankle in a symptomatic 62-year-old man with Haglund's deformity shows Achilles tendinopathy (arrowhead), a distended fluid-filled retrocalcaneal bursa and prominent posterosuperior calcaneal exostosis with increased marrow signal intensity indicative of oedema (white arrow). There is inflammation of Kager's fat pad (black arrow).





**Fig. 7** (a) Sagittal proton density (PD)-weighted, fat-saturated, T1-W and (b) axial PD-weighted, fat-saturated MR images of the left ankle in a 48-year-old man with longitudinal tears of the Achilles tendon on a background of severe non-insertional Achilles tendinopathy. There is thickening and loss of the normal hypointense signal of the tendon. The longitudinal hyperintense signal seen within the mid-tendon substance is in keeping with longitudinal partial tears (white arrows).



**Fig. 8** (a) Sagittal and (b) axial contrast-enhanced, T1-W MR images of the right ankle in a 33-year-old woman show an enlarged retrocalcaneal bursa complicated by abscess formation. A rim-enhancing collection is arising from the retrocalcaneal bursa (black arrow in a). Adjacent Achilles tendinopathy and thickening, reactive enhancement of the soft tissue posterior to the Achilles tendon (white arrow in a) are seen. The retrocalcaneal rim-enhancing collection (arrowheads in b) lies anterior to the Achilles tendon (white arrow in b).

collections/abscesses within the ankle and foot region, as some may require more aggressive management.

MR imaging is superior in demonstrating the anatomical relationship between the inflamed retrocalcaneal bursa and adjacent Achilles tendon. The retrocalcaneal bursa may be visualised on MR imaging of the normal ankle. However, it is only considered abnormal when its dimensions exceed 6 mm (superior-to-inferior), 3 mm (transverse) and 2 mm (anteroposterior), as suggested by Bottger et al.<sup>(10)</sup> Although some asymptomatic individuals have a prominent bursa, it has been proven that patients with increased bursal fluid are more likely to be symptomatic.<sup>(10)</sup> The advantage of MR imaging is the ability to confirm the presence of marrow oedema associated with a prominent posterosuperior calcaneal process in symptomatic patients (Fig. 6). Marrow oedema is also seen in recent or stress fractures of the calcaneus, which can go undetected on initial evaluation, and is an important condition to exclude. MR imaging is also useful for assessing the adjacent Achilles tendon for the

presence of concomitant insertional tendinosis. This allows evaluation of the need for intraoperative debridement of the tendon alongside posterosuperior calcaneal process excision when surgery is indicated.<sup>(10)</sup> MR imaging can exclude other causes of posterior heel pain not due to Haglund's disease, as it may be used to diagnose isolated, non-insertional Achilles tendon problems such as tendinosis, paratenonitis and tears (Fig. 7). Furthermore, MR imaging is superior in the detection and characterisation of lesions such as masses, infected abscesses (Figs. 8a & b) and vascular anomalies.

The causes of posterior heel or hind foot pain, which should also be considered in the differential diagnosis, include isolated Achilles tendinopathy and isolated retrocalcaneal bursitis. Other conditions such as rheumatoid arthritis; seronegative spondyloarthropathies, including reactive arthritis (Reiter's disease) and ankylosing spondylitis causing enthesopathies or marrow oedema; and referred pain from lumbosacral radiculitis are possible differentials, although there is usually

known pre-existing disease in such cases. Mimics of Haglund's disease that were previously reported in the literature include tuberculous infections of the posterior heel and tumours such as osteochondromas.<sup>(11,12)</sup>

Conservative management is the mainstay of treatment, while surgery may be offered in difficult or complex cases, and those that are refractory to conservative treatment. The main aims of non-surgical management are to reduce underlying inflammatory bursitis and relieve tension in the Achilles tendon. Treatments include modifications to reduce friction between the patient's footwear and the inflamed retrocalcaneal bursa, using heel lifts and heel pads to reduce pressure on the heel when walking, and performing daily calf-stretching exercises to relieve tension from the Achilles tendon. Non-steroidal anti-inflammatory drugs may be beneficial in reducing pain from underlying inflammatory changes in the posterior heel or Achilles tendinopathy. Percutaneous injection of steroids around the Achilles tendon may also relieve discomfort, but is generally not recommended due to the risk of tendon rupture. Direct injection of steroids into the retrocalcaneal bursa, however, has been reported to relieve symptoms. Sofka et al reported complete relief of symptoms in a patient after a direct US-guided injection of a steroid/anaesthetic mixture into the retrocalcaneal bursa.<sup>(9)</sup> In most patients, conservative management has a positive outcome, particularly for those without retrocalcaneal bursitis and/or problems associated with the Achilles tendon.<sup>(5)</sup>

Surgery for Haglund's disease is indicated when conservative management fails. Depending on the severity of the condition, surgical treatment aims at resection of the posterosuperior calcaneal prominence, excision of the inflamed retrocalcaneal

bursa and/or repair of the Achilles tendon, in cases of significant tendinopathy. Many open and arthroscopic-guided techniques have been described, with varying outcomes. Good-to-excellent outcomes have been reported in 73%–97% of heels that underwent open operative procedures.<sup>(13)</sup> Arthroscopic-guided surgery for Haglund's disease is usually performed using two or three portal techniques, and good outcomes have been reported in the literature. In one study using a two-portal arthroscopic surgical technique, patients experienced a reduction in time to return to normal activity, low surgical morbidity and high satisfaction rates.<sup>(14)</sup> For patients, the option of either open or arthroscopic-guided surgery is usually dependent on the surgeon's experience.

In conclusion, while a combination of thorough history-taking and careful clinical examination is required to diagnose Haglund's disease, imaging is especially helpful in increasing the diagnostic probability of the condition. In particular, advanced imaging modalities such as MR imaging can be used to confidently diagnose and aid in solving difficult or complex clinical problems, including helping to guide surgical management when it is indicated, as well as excluding other disorders that may have a similar presentation. This is important to allow accurate, timely patient management and achieve a desirable clinical outcome.

## REFERENCES

1. Haglund P. [Beitrag zur Klinik der Achillessehne]. *Zeitschr Orthop Chir* 1928; 49:49-58. German.
2. Vyce SD, Addis-Thomas E, Mathews EE, Perez SL. Painful prominences of the heel. *Clin Podiatr Med Surg* 2010; 27:443-62.
3. Pavlov H, Heneghan MA, Hersh A, Goldman AB, Vigorita V. The Haglund syndrome: initial and differential diagnosis. *Radiology* 1982; 144:83-8.
4. Kadakia AR. Heel pain and plantar fasciitis: hindfoot conditions. In: DeLee J, Drez D, Miller MD, eds. *DeLee and Drez's Orthopaedic Sports Medicine: Principles and Practice*. Philadelphia: Saunders, 2015: 1442-52.
5. Van Aman S, Cooper MT. Haglund's deformity (pump bump). In: Miller MD, Hart JA, Macknight JM, eds. *Essential Orthopedics*. Philadelphia: Saunders, 2010: 755-7.
6. Clancy WG. Runners' injuries. Part two. Evaluation and treatment of specific injuries. *Am J Sports Med* 1980; 8:287-9.
7. Singh R, Rohilla R, Siwach RC, et al. Diagnostic significance of radiologic measurements in posterior heel pain. *Foot (Edinb)* 2008; 18:91-8.
8. Bulstra GH, van Rhee TA, Scholtes VA. Can we measure the heel bump? Radiographic evaluation of Haglund's deformity. *J Foot Ankle Surg* 2015; 54:338-40.
9. Sofka CM, Adler RS, Positano R, Pavlov H, Luchs JS. Haglund's syndrome: diagnosis and treatment using sonography. *HSS J* 2006; 2:27-9.
10. Petersen B, Fitzgerald J, Schreiber K. Musculotendinous magnetic resonance imaging of the ankle. *Semin Roentgenol* 2010; 45:250-76.
11. Gillott E, Ray P. Tuberculosis of the calcaneum masquerading as Haglund's deformity: a rare case and brief literature review. *BMJ Case Rep* 2013; 2013.
12. Jung HG, Carag JA, Park JY, et al. Osteochondroma of the calcaneus presenting as Haglund's deformity. *Foot Ankle Surg* 2011; 17:e20-2.
13. Frey C. Haglund's deformity: open and arthroscopic treatment. In: *Operative Techniques: Foot and Ankle Surgery*. Philadelphia: Saunders, 2009: 547-56.
14. Ortmann FW, McBryde AM. Endoscopic bony and soft-tissue decompression of the retrocalcaneal space for the treatment of Haglund deformity and retrocalcaneal bursitis. *Foot Ankle Int* 2007; 28:149-53.

**ABSTRACT** A 30-year-old woman presented with a six-month history of left posterior heel pain. Physical examination revealed a tender, inflamed and indurated posterior heel with a visible bony prominence of the posterosuperior aspect of the calcaneus. Lateral ankle radiography showed a prominent left posterosuperior calcaneal tuberosity and thickening of the distal Achilles tendon outline. Magnetic resonance imaging demonstrated high-signal inflammatory fluid in the retrocalcaneal bursa, increased signal intensity and thickening of the Achilles tendon, and prominence of the posterior calcaneus tuberosity with reactive marrow oedema. The findings are consistent with Haglund's deformity. The patient underwent hind foot surgery after failing a six-month course of conservative therapy. There was no further recurrence of symptoms after surgery. The clinical and radiological features of Haglund's deformity are described, including a short discussion of other causes of hind foot pain.

**Keywords:** Achilles tendon, Haglund's deformity, hind foot pain, magnetic resonance imaging

## SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME

(Code SMJ 201609B)

### Question 1. Regarding Haglund's deformity:

- (a) The condition has a higher incidence in men.
- (b) It usually affects patients who are in their second and third decade of life.
- (c) It consists of a triad of retrocalcaneal bursitis, Achilles tendinosis and posterosuperior calcaneal bony prominence.
- (d) The Haglund's deformity refers to an inflamed and swollen retrocalcaneal bursa.

True False

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

### Question 2. Regarding patients with posterior heel pain:

- (a) Patients may report aggravation of symptoms after chronic activity such as long-distance running.
- (b) Tenderness localised to the retrocalcaneal bursa can be elicited with passive plantarflexion.
- (c) Physical examination to exclude a calcaneal stress fracture should be performed.
- (d) Conditions such as reactive arthritis, rheumatoid arthritis and referred pain from lumbosacral radiculitis should be considered in the differential diagnosis.

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

### Question 3. Regarding evaluation of Haglund's deformity on radiography and ultrasonography:

- (a) A lateral view, non-weight-bearing ankle radiograph is used for measurement of radiographic parameters.
- (b) There is no single radiographic parameter that can confidently diagnose the condition.
- (c) A curvilinear ultrasound transducer is frequently used for sonographic evaluation of the foot.
- (d) Ultrasonography cannot distinguish cystic masses from solid masses that may mimic the disease.

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

### Question 4. Regarding evaluation of Haglund's deformity with magnetic resonance (MR) imaging:

- (a) It is superior in demonstrating the anatomical relationship between the inflamed retrocalcaneal bursa and Achilles tendon.
- (b) It has the added advantage of being able to assess bone marrow for the presence of oedema.
- (c) The visualisation of a retrocalcaneal bursa on MR imaging is always considered abnormal.
- (d) It is superior in the characterisation of masses, abscesses and vascular anomalies.

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

### Question 5. Regarding management of Haglund's deformity:

- (a) Surgical therapy is the primary mode of treatment for most patients.
- (b) The main aims of treatment include reducing inflammatory bursitis and relieving tension in the Achilles tendon.
- (c) Percutaneous injection of steroids around the Achilles tendon to relieve tendinopathy is recommended.
- (d) Surgery typically involves excision of Haglund's deformity.

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

### Doctor's particulars:

Name in full : \_\_\_\_\_  
 MCR number : \_\_\_\_\_ Specialty: \_\_\_\_\_  
 Email address : \_\_\_\_\_

### SUBMISSION INSTRUCTIONS:

(1) Visit the SMJ website: <http://www.smj.org.sg/current-issue> and select the appropriate set of questions. (2) Provide your name, email address and MCR number. (3) Select your answers and click "Submit".

### RESULTS:

(1) Answers will be published online in the SMJ November 2016 issue. (2) The MCR numbers of successful candidates will be posted online at the SMJ website by 2 November 2016. (3) Passing mark is 60%. No mark will be deducted for incorrect answers. (4) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council. (5) One CME point is awarded for successful candidates.

**Deadline for submission: (September 2016 SMJ 3B CME programme): 12 noon, 26 October 2016.**