Radiology Case Reports 19 (2024) 6609–6613

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

A rare case of osteoarticular tuberculosis and tuberculous osteomyelitis of the left foot without pulmonary involvement ☆,☆☆

Rithika Ramadugu[a,b,#], *Tarun Kumar Suvvari*[b,c,#,*], *Sameera Ramadugu*[d], *Sravani Temburu*[b,c], *Devang Srivastava*[b,e]

[a] *Department of medicine, Kamineni Academy of Medical Sciences and Research Centre, LB Nagar, Hyderabad, India*
[b] *Department of clinical research, Squad Medicine and Research (SMR), Amadalavalasa, Andhra Pradesh, India*
[c] *Department of Medicine, Rangaraya Medical College, Kakinada, Andhra Pradesh, India*
[d] *Department of medicine, Gandhi Medical College, Hyderabad, India*
[e] *Department of medicine, Kakatiya Medical College, Warangal, India*

ARTICLE INFO

Article history:
Received 28 June 2024
Revised 14 September 2024
Accepted 17 September 2024

Keywords:
Tuberculosis
Osteoarticular tuberculosis
TB osteomyelitis
Case report

ABSTRACT

Tuberculosis (TB) of the musculoskeletal system is an uncommon manifestation, accounting for only 1-3% of all TB cases and typically affects the spine and large joints. Isolated TB of the foot is even rarer, comprising less than 10% of osteoarticular TB. Tuberculous osteomyelitis, where the infection is limited to the bone without joint involvement, is an even more uncommon presentation. A 55-year-old male with a history of fall presented with chronic left foot pain and swelling. Initial workup led to a misdiagnosis of Charcot foot. Despite treatment with analgesics and intra-articular platelet-rich plasma injections, symptoms still persisted for several months. MRI revealed inflammation in multiple joints with bone damage (erosions & edema) along with reduced joint space in talonavicular joint and Mycobacterium tuberculosis was identified on interferon gamma release assay. The patient was ultimately diagnosed with diffuse osteoarticular tuberculosis and tuberculous osteomyelitis of the left foot and commenced on anti-tubercular therapy. After few months symptoms were resolved and patient was tested negative for TB. Our case highlights the importance of maintaining a high index of suspicion for osteoarticular tuberculosis, even in the absence of pulmonary involvement, especially in immunocompromised patients like diabetics. This case emphasizes the importance of a multidisciplinary approach for accurate diagnosis and effective management of such challenging presentation.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☆☆ Acknowledgments: Special thanks to Squad Medicine and Research (SMR) for their guidance and help in publication. No funding received.

* Corresponding author.
E-mail address: drtarunsuvvariresearch@gmail.com (T.K. Suvvari).
# Joint 1st authors (contributed equally).

https://doi.org/10.1016/j.radcr.2024.09.088

Introduction

Tuberculosis (TB) of the musculoskeletal system is an uncommon manifestation, accounting for only 1%-3% of all TB cases and typically affects the spine and large joints [1,2]. Isolated TB of the foot is even rarer, comprising less than 10% of osteoarticular TB [2]. Tuberculous osteomyelitis, where the infection is limited to the bone without joint involvement, is an even more uncommon presentation [2,3]. We present a case of diffuse osteoarticular TB and tuberculous osteomyelitis of the left foot in the absence of pulmonary TB, highlighting the diagnostic challenges and the importance of maintaining a high index of suspicion for this condition.

Case report

A 55-year-old male presented with chronic pain and swelling in his left foot, which reportedly had onset after history of fall from stairs, and progressed gradually. The patient also reported significant decrease in appetite associated with weight loss of 25 kilograms over the previous 1.5 year. The patient had no history of exposure to TB and already vaccinated with BCG in the past. The examination findings were not consistent with infectious etiology. There was gross inflammation of the left ankle, localized to the dorsum of the foot from the medial malleolus to the navicular tubercle, restricting the movements. No lesions were observed on the skin. Tenderness could be elicited but there was no local rise of temperature or crepitus. Percussion revealed a dull note.

Routine investigations were done along with X-ray and magnetic resonance imaging (MRI) left foot (Fig. 1). The patient was misdiagnosed as Charcot foot based on the HbA1c (6.6), MRI scan and positron emission tomography (PET) scan findings. Initial MRI findings were - diffuse altered signal intensities with edema in navicular bones, cuneiform bones, base of 1, 2 and 3 metatarsal bones with irregular articular margins of 1, 2, 3. Tarsometarsal joints, diffuse adjacent soft tissue swelling and diffuse subcutaneous edema in dorsum of foot. F/S/o Infective etiology, multifocal osteomyelitis / early Charcot joint. The PET scan revealed reduced joint space with articular surface erosions and increased fluorodeoxyglucose (FDG) uptake involving third, fourth, fifth Tarsometatarsal joint, talonavicular joint and navicular-cuneiform joint of left foot with surrounding soft tissue edema – Features were a concern for degenerative arthritis with associated inflammation. The patient was treated with metformin, analgesics and intra-articular platelet rich plasma (PRP) injections.

When no improvement was seen over a few months, further investigations were done and reports revealed elevated C-reactive protein (63.9 mg/L) and Erythrocyte sedimentation rate, ESR (33 mm/hr). The rest of the investigations including Hemogram, Anti streptolysin – o (ASO), complement 3 (c3), Anti CCP(ACCP), Rheumatoid Factor (RF), C-reactive protein(CRP), complete urine examination, random blood glucose, serum urea, serum creatinine, iron profile, Liver function tests (LFT), Thyroid function tests (T3,T4 and TSH), Renal function tests (RFT), GFR and peripheral blood smear

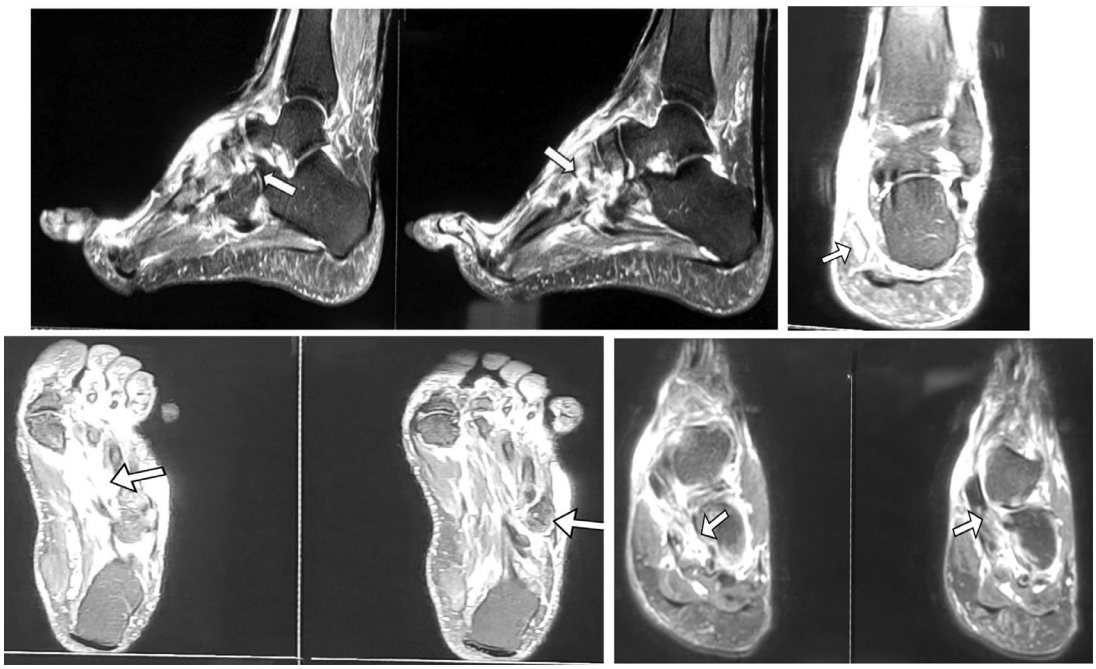

Fig. 1 – Initial (First) MRI of left foot showing Diffuse Hyperintensities in navicular bone, medial intermediate and lateral cuneiform bones, base of 1, 2 and 3 metatarsal bones showing hypointense signals on T1, subtle hyperintense signals on 12 and diffuse hyperintensities on STIR imaging. 1, 2 and 3 tarsometatarsal joints show reduced joint space, subarticular ederma and articular surface irregularity. Diffuse edema around ankle joint, dorsum and plantar surface of foot. Mild intra and extra articular joint effusion in tibiotalar joint and talocalcaneal joint.

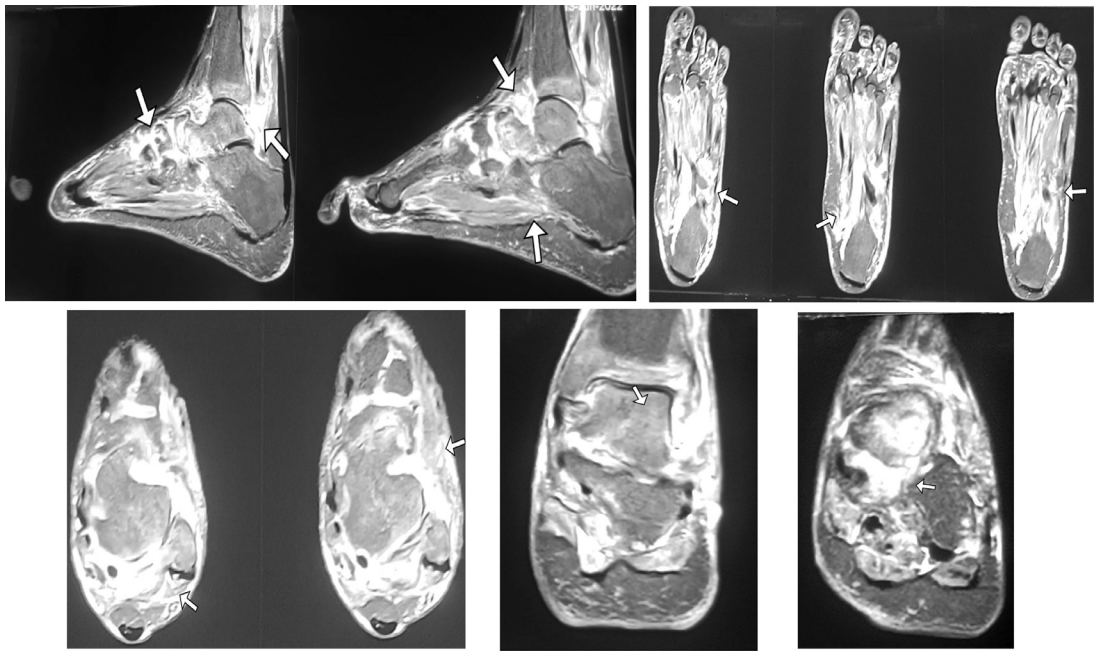

Fig. 2 – Later (second) MRI of foot showing Mild joint effusion and hypertrophied synovium seen in tiblo-fibular joint space with articular Surface erosions and adjacent marrow edema. Moderate loculated joint effusion and hypertrophied synovium in talocrural, talo-calcaneal, anterior subtalar, internetatarsal and tarso-metatarsal joint spaces with multiple articular surface erosions. Severely reduced talo-navicular joint space with increased bone marrow signal on STIR. Minimal fluid around distal flexor hallucis longus and peroneal tendons.Mild subcutaneous edema noted around ankle joint.

were within normal limits. ANA screening (immunofluorescence) and ANA Titre (immunofluorescence) were negative. The chest X-ray was normal, showing no consolidation, no Fibro-calcification or Ghon's focus. The MRI scan was repeated for further evaluation. The later MRI (Fig. 2) revealed features suggestive of Infective / inflammatory synovitis of tibiofibular, talocrural, talo-calcaneal, anterior subtalar, intermetatarsal and Tarso-metatarsal joint spaces with adjacent articular surface erosions and bone marrow edema; Severely reduced Talo-navicular joint space with increased bone marrow signal on Short tau inversion recovery (STIR); Minimal distal flexor hallucis longus and peroneal tendinopathy. X-RAY of foot revealed reduced densities of talus and navicular joints (osteopenic changes) (Fig. 3).

Tuberculous etiology was suspected in view of chronicity. A surgical biopsy was done and revealed multiple pockets of yellowish-brown turbid pus (50 mL) and infected tissue which was drained and synovectomy was done following which, debridement of the surface erosions and resection of affected parts of talus and navicular bones was done. Navicular and talus bone fragments, pus and granulation tissue were sent for histopathology examination, gram stain, ZN stain, culture and sensitivity. MTB GeneXpert was done after the histopathological examination (HPE) reports. Interferon gamma release assay was later done, and based on above investigations the patient was diagnosed with tuberculosis.

The patient was already taking oral hypoglycemic drugs (OHAs) in view of high HbA1c. Synovial biopsy was done under general anesthesia, during which, the infected tissue was debrided, and saline wash was done. Immediately, the patient was started on Anti-tubercular therapy (ATT) - intensive phase for a period of 1 months and the patient developed drug induced hepatitis which presented with jaundice and deranged liver function tests. The drugs were stopped and reintroduced gradually. After an intensive phase of 2 months and continuation phase of ATT for 7 months, Interferon gamma release assay was repeated and was positive. The continuation phase was continued for 6 more months, and finally the patient was tested negative for tuberculosis (Fig. 4).

Discussion

The World Health Organization (WHO) estimates that approximately one-fourth of the global population is exposed to tuberculosis (TB), with 5%-10% developing the disease over their lifetime [3]. While the Bacille Calmette-Guérin (BCG) vaccine is administered once to provide protection against TB, it is generally not effective in adults and adolescents, who represent the majority of TB cases [4,5]. Tuberculosis can affect extra-pulmonary sites, but osteoarticular tuberculosis (OAT) of the foot is particularly rare [6]. This form of TB manifests with symptoms common to other types of extra-pulmonary tuberculosis, including stiffness, pain, and swelling. Significant weight loss and muscle atrophy may also occur, as seen in the presented case [6].

Risk factors for developing OAT include immunodeficiency, organ transplants, renal failure, dialysis, and smoking. The bacilli typically spread hematogenously, with a predilection for joints that have experienced recent trauma due to increased vascularity, as well as prosthetic joints. Osteoarticu-

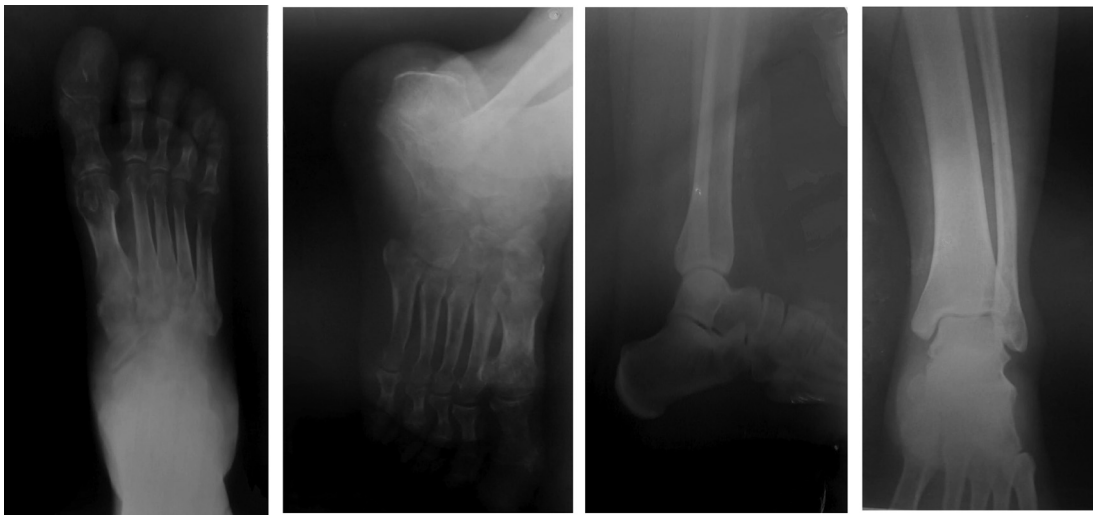

Fig. 3 – X-ray of foot revealed reduced densities of talus and navicular joints (osteopenic changes).

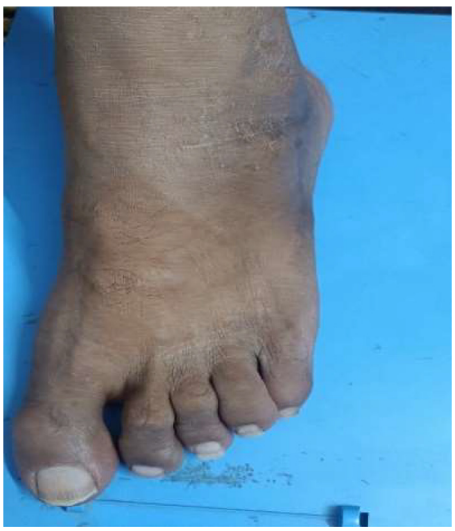

Fig. 4 – Well healed surgical scar after completion of the anti-tubercular therapy and tested negative for TB.

lar TB can present as arthritis or osteomyelitis, affecting either long or small bones [7-9]. In the foot, the talus, navicular, cuboid, calcaneus, metatarsi, phalanges, and cuneiform bones are commonly involved [3]. The prognosis of OAT in the foot depends on the affected tissues and the extent of the infection. In the midfoot, infection spreads rapidly due to intercommunicating spaces. Tarsal swelling develops gradually, potentially leading to abscess formation and bone destruction. In advanced stages, this may present as a discharging sinus or ulcer [10].

In the present case, initial MRI findings indicated involvement of the navicular, cuneiform, and bases of the metatarsals. Later MRI scans revealed bone marrow edema, severely reduced joint spaces, and synovitis of multiple joints, corresponding to stage 4 of Martinis and Quahas classification, indicating anatomic disorganization and subluxation [11–13]. The delayed diagnosis resulted in the co-occurrence of tuberculous osteomyelitis and tuberculous arthritis. In many reported cases of osteoarticular tuberculosis (OAT), diagnosis is often delayed due to inconsistencies in patient history and the lack of definitive radiological findings. This is particularly challenging in cases without pulmonary involvement. Common radiological differential diagnoses include osteomyelitis, inflammatory arthritis, Charcot's arthropathy, gout, nephropathic joints, sarcoidosis, bone/soft tissue tumors, Paget's disease, and hyperparathyroidism. In OAT, joint space narrowing occurs gradually, unlike the earlier onset seen in pyogenic and rheumatoid arthritis [11–13].

Phemister's triad—peri-articular osteoporosis, peripheral osseous erosions, and progressive gradual narrowing of the interosseous space—is a key radiological indicator for OAT. Despite the presence of these findings, diagnosis can be delayed due to a lack of TB exposure history and the absence of a primary focus [12,13]. Mittal et al. described various radiological patterns of TB of the foot, including cystic, rheumatoid, subperiosteal, "kissing," and spina ventosa patterns [14]. In this case, the initial presentation was rheumatic, progressing later to spina ventosa.

Histopathological examination is often considered the gold standard for diagnosis in spinal TB, but in OAT of the foot, tubercles may or may not be present. Confirmation can be achieved through surgical biopsy of osseous lesions or synovial membrane, or aspiration of synovial fluid. Pathological examination may reveal granulomas, Langhans cells, or caseating necrosis, and cultures can provide a definitive diagnosis [10]. In this case, a caseating ill-defined tuberculous granuloma was observed. Despite the negative results from ZN stain and cultures for acid-fast bacilli, Koch's lesions were identified in bone fragments, and granulomatous tissue showed fibrocollagenous tissue with granulomas, central scant necrosis, foreign body, and Langhans giant cells, all indicative of Koch's etiology.

In our case, although the organism could not be isolated in culture and ZN stain showed no tubercle bacilli, the diagnosis was confirmed through GeneXpert PCR test and Interferon gamma release assay. Patients are typically treated with

ATT unless resistant to rifampicin, pyrazinamide, isoniazid, and ethambutol, or if there is a deformity or painful joint that needs a surgical intervention [2,3]. There is a pressing need for a new TB vaccine focusing on the protection of adolescents and adults in developing countries. Osteoarticular TB should be considered as a differential diagnosis even without a history of TB exposure or primary focus, based on radiological findings.

Conclusion

Our case highlights the importance of maintaining a high index of suspicion for osteoarticular tuberculosis, even in the absence of pulmonary involvement, especially in immunocompromised patients like diabetics. This case emphasizes the importance of a multidisciplinary approach for accurate diagnosis and effective management of such challenging presentation.

Ethics statement

In our university, ethics approval was not required for case reports and case series.

Availability of data and materials

Not applicable.

Authors contributions

Ramagudu R - Idea, conceptualization, supervision, writing draft, approved final draft. **Suvvari TK** - conceptualization, Supervision, writing draft and revision of draft, approved final draft. **Ramagudu S** - Resources, writing draft, revision of draft and approved final draft. **Temburu S** - writing draft and revision of draft, approved final draft. **Srivasatava D** - writing draft and revision of draft, approved final draft.

Patient consent

I am confirming that written, informed consent for publication of the case and images was obtained from the patient.

REFERENCES

[1] Sharma SK, Mohan A, Kohli M. Extrapulmonary tuberculosis. Expert Rev Respir Med 2021;15(7):931–48. doi:10.1080/17476348.2021.1927718.

[2] Hazra D, Shaji V R, Dhall A, Rao AP, Bhat AK, Chawla K. A ten-year experience of musculoskeletal tuberculosis at a tertiary care hospital in South India. J Orthop 2024 3;56:92–7. doi:10.1016/j.jor.2024.05.001.

[3] Kori VK, Bandil D, Asthana M, Maravi DS. Osteoarticular tuberculosis in Central India: changing epidemiological profile and emerging challenges. Int J Mycobacteriol 2023;12(1):28–32. doi:10.4103/ijmy.ijmy_233_22.

[4] Katelaris AL, Jackson C, Southern J, Gupta RK, Drobniewski F, Lalvani A, et al. Effectiveness of BCG vaccination against mycobacterium tuberculosis infection in adults: a cross-sectional analysis of a UK-based cohort. J Infect Dis 2020;221(1):146–55. doi:10.1093/infdis/jiz430.

[5] Cho T, Khatchadourian C, Nguyen H, Dara Y, Jung S, Venketaraman V. A review of the BCG vaccine and other approaches toward tuberculosis eradication. Hum Vaccin Immunother 2021;17(8):2454–70. doi:10.1080/21645515.2021.1885280.

[6] Faroug R, Psyllakis P, Gulati A, Makvana S, Pareek M, Mangwani J. Diagnosis and treatment of tuberculosis of the foot and ankle: a literature review. Foot (Edinb) 2018;37:105–12. doi:10.1016/j.foot.2018.07.005.

[7] Basnayake O, Mathangasinghe Y, Nihaj A, Pitagampalage R, Jayarajah U, Gunawardena K, Mendis H. Tuberculosis presenting as arthritis of the ankle: A case report. SAGE Open Med Case Rep 2021;9:2050313X211035574. doi:10.1177/2050313X211035574.

[8] Hayat T, O'Shaughnessy T. Multifocal tuberculous osteomyelitis. Pract Neurol 2015;15(3):227. doi:10.1136/practneurol-2014-001028.

[9] El Farhaoui A, Batou Y, Benalia K, Lachkar A, Abdeljaouad N, Yacoubi H. Tuberculosis of navicular bone: an exceptional localization of osteoarticular tuberculosis. Radiol Case Rep 2023;18(5):1989–92. doi:10.1016/j.radcr.2023.01.061.

[10] Dhillon MS, Aggarwal S, Prabhakar S, Bachhal V. Tuberculosis of the foot: an osteolytic variety. Indian J Orthop 2012;46(2):206–11. doi:10.4103/0019-5413.93683.

[11] Boussel L, Marchand B, Blineau N, Pariset C, Hermier M, Picaud G, et al. Imagerie de la tuberculose ostéo-articulaire [Imaging of osteoarticular tuberculosis]. J Radiol 2002;83(9 Pt 1):1025–34 French.

[12] Pattamapaspong N, Kanthawang T, Bouaziz MC, Ladeb MF, Hammami N, Peh WCG. Imaging of musculoskeletal tuberculosis. Br J Radiol 2024;97(1153):1–12. doi:10.1093/bjr/tqad019.

[13] Jangid R, Solanki R S, Chaudhary V, Sud A, Kaur R. Spectrum of imaging findings in osteoarticular tuberculosis. Egypt J Radiol Nucl Med 2024;55:23. doi:10.1186/s43055-024-01191-5.

[14] Mittal R, Gupta V, Rastogi S. Tuberculosis of the foot. J Bone Joint Surg Br 1999;81(6):997–1000. doi:10.1302/0301-620x.81b6.9925.