

From the ground up: recognising risk of frailty syndromes and functional decline through foot examination

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SUMMARY

Foot pathologies in older adults are associated with falls and complications such as amputations and ulcers. We report a case of an older man who presented to the geriatric medicine outpatient clinic. History taking revealed a fall, recent episode of delirium and decline in functional status with the patient reporting he was no longer able to cut his own toenails. Medical history included hypothyroidism, depression and hearing impairment. Physical examination detected very long, thickened toenails with bilateral bony deformities of the foot. Additionally, he had borderline slow gait speed and had difficulty completing a chair stand. Inability to maintain foot care suggested an early insight into a deterioration of overall function and emergence of frailty. An interprofessional team approach to the patient's care included a medication review, referrals to podiatry, orthotics, physiotherapy and occupational therapy. His toenails were debrided and orthopaedic shoes were prescribed with no further falls.

BACKGROUND

Foot pain and deformities are associated with falls, impaired mobility and functional status.^{1–3} Older adults are particularly affected due to changes in the foot that occur as part of the ageing process. These include changes in the size and shape of the feet, increased xerosis and reduced collagen.⁴ Foot disorders are also more common in older adults with increased prevalence of mycotic nail infections, hallux valgus and foot arthritis.^{5,6} Maintaining foot hygiene and regular foot care are imperative to prevent these pathologies and resulting complications such as falls. However, many older adults with declining functional status cannot complete foot care independently.^{7,8} Medical students and doctors are also often less comfortable examining the feet than other areas.⁹ We describe a case of a patient with long toenails and multiple foot pathologies who presented to a geriatric medicine outpatient clinic for assessment of falls, frailty and cognitive impairment.

CASE PRESENTATION

A 78-year-old man was referred to an interprofessional geriatrics outpatient clinic for assessment of memory and mobility impairment as well as declining functional status. The patient was accompanied by his son, whom the patient described as being very supportive and attentive to his care needs. The patient had a medical history of



Figure 1 Patient's left foot with long toenails, onychomycosis, xerotic skin and hallux valgus.

hypothyroidism, sensorineural hearing impairment, depression and post-traumatic stress disorder. He was prescribed one medication: levothyroxine 100 µg/day. History taking revealed a fall within the past month while walking outside. He had also had a recent hospital admission with influenza A, complicated by delirium. The patient self-reported impaired short-term memory. Collateral history provided by the patient's son described the patient frequently repeating himself and needing reminders about planned events. Formal cognitive testing had been completed 6 months previously and revealed impairment in multiple cognitive domains. On review of systems, the patient described bilateral foot pain. He reported pain in his left hip. He also described low mood.

His social history was relevant for having completed second level education. He was a veteran of the United States military, having served during the Vietnam war. He lived with his wife and their dog and enjoyed taking it for daily walks. On review of functional status, the patient reported difficulty cutting his toenails and required assistance for bathing. He was independent in all other activities of daily living. In terms of instrumental activities of



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Box 1 Foot examination method for older adults

1. Ask the patient to don and doff footwear and socks without help if possible.¹⁵
2. Inspect type of shoes (slip on, laces, velcro) and if any wear present.¹⁶
3. Examine skin for dryness, skin integrity, calluses and overall hygiene.
4. Inspect length and thickness of nails.¹⁴
5. Examine nails for the presence of fungal infections.
6. Inspect feet for bony deformities for example, hallux valgus.
7. Check pedal pulses for evidence of arterial insufficiency.
8. Complete Ipswich touch test for light touch sensation.*¹⁷

*The Ipswich touch test is a validated test for light touch sensation. It is performed on bare feet by assessing light touch sensation on the tips of the hallux, third and fifth toes bilaterally using the index finger. If sensation is altered at two or more locations examined, the test is considered abnormal.

daily living, the patient was independent in managing medications and finances, although he reported losing money to phone scams in the past year. He required assistance with grocery shopping, cleaning and laundry, and was dependent on his wife and son for cooking and driving. He had previously been able to complete these activities independently.

On physical examination, general inspection revealed a well-dressed older male with mild muscle wasting of the lower extremities. Blood pressure was 118/76 mmHg and heart rate was 92 beats/min. Orthostatic blood pressure measurements were negative. Deep tendon reflexes were normal bilaterally and Romberg's test was negative. Visual acuity and fields were intact. His gait was non-shuffling and steady. Four-metre gait speed was 0.8 m/s without the use of an assistive device, which indicates borderline slow gait. He completed a chair stand with difficulty. The patient wore shoes with laces. He found it difficult to remove and don his shoes and socks. Examination of the feet revealed long, thickened toenails which had grown beyond the tips of his toes. Bilateral hallux valgus and calluses were present on both feet. Overall, foot hygiene was poor and the skin was xerotic (figure 1). Palpation revealed intact, warm skin with palpable pedal pulses. Mental state examination revealed a blunted affect, impaired short-term memory and decreased ability to draw a clock. A Montreal Cognitive Assessment was completed with a total score of 14/30.

Table 1 Differential diagnoses of foot problems in older adults

Condition	Characteristics
Difficulty cutting toenails	Cognitive or physical impairment limiting ability to bend over and coordinate task. ¹⁸
Difficulty putting on and removing footwear	Cognitive or physical impairment limiting ability to bend over and coordinate task. ¹⁶
Fungal nail disorders	Thickened nails with increased pigmentation and onycholysis. ¹¹
Pes cavus	Higher than normal arch of foot with resulting excessive pressure on metatarsal heads. ⁴
Hallux valgus	Bunion deformity which may lead to ill-fitting footwear.
Bony foot deformities	Including hallux valgus and hammertoes which may lead to pain and ulceration. ⁵
Degenerative and inflammatory arthritis	Foot pain and stiffness. ⁵
Hyperkeratosis	Areas of increased keratinisation such as calluses and corns. ¹⁹

Laboratory investigations revealed a raised vitamin B₁₂ (>1000 pg/mL). All other tests were within normal limits including thyroid stimulating hormone, T4, haemoglobin A1C, glucose and electrolytes.

DIFFERENTIAL DIAGNOSIS

There were several possible causes for suboptimal foot care and inability to cut toenails in this case. The patient reported hip pain which may have limited his ability to bend down. His symptoms of memory impairment affecting functional status suggested a probable diagnosis of dementia which may have caused him not only to forget complete foot care but also contributed to difficulty in planning and executing this task. Depressive symptoms may have reduced his motivation and interest to maintain foot care and hygiene. Dry skin is more common in older age.

TREATMENT

The interprofessional team (physician, nurse practitioner, social worker, pharmacist) devised a treatment plan in collaboration with the patient and his son. At the end of the clinic visit, the patient and his son were educated on the importance of foot care and appropriate footwear. Techniques to maintain foot hygiene such as careful drying between toes were reviewed. A referral was made to podiatry. A device to assist with donning socks was ordered. He was referred to orthotics for custom shoes to provide maximal comfort and minimise falls risk. A home nursing, physiotherapy and occupational therapy visit was arranged to review mobility, functional status and prescribe appropriate adaptive devices. A selective serotonin reuptake inhibitor was initiated to treat depression. The interprofessional team discussed the feasibility of domiciliary care and/or video visits in the event that he is unable to attend clinic appointments in the future.

OUTCOME AND FOLLOW-UP

Two months later, a member of the interprofessional team followed up with the patient. He had attended appointments with podiatry and orthotics. Podiatry assessment detected long, onychomycotic toenails with bilateral pes cavus, hammertoe deformities and bilateral hallux valgus. Fat pad atrophy and bilateral calluses were also found. The toenails and calluses were debrided. Orthopaedic shoes were prescribed by orthotics to prevent further deformities, relieve pain and reduce falls risk. His mood had improved and he had not fallen since.

DISCUSSION

Older adults may have difficulty maintaining adequate foot care for many reasons including arthritic pain limiting the ability to bend over, cognitive or sensory impairment. Previous studies in the United Kingdom report between 77% and 89% of older adults have difficulty cutting their own toenails.^{7 8} Long, unkempt toenails and foot problems may be an indicator of an older adult with declining ability to complete activities of daily living and emerging frailty.^{10 11}

Detecting foot problems is recommended in several international guidelines for falls prevention in older adults. In 2010, the American Geriatrics Society and British Geriatrics Society published a joint falls prevention guideline which recommends foot examination.² The National Institute for Health and Clinical Excellence recommends a review of footwear in any patient with a history of falls or increased falls risk.¹² The Centers for Disease Control and Prevention Stopping Elderly Accidents, Deaths & Injuries falls prevention initiative includes foot examination.¹³ Appropriate technique for foot examination in the

older adult and differential diagnosis of potential findings are detailed in [box 1](#) and [table 1](#).

This case highlights the importance of examining an older patient's feet at every assessment. Foot examination is a quick but often overlooked part of the physical examination. However, it can detect remediable podiatric issues and causes of foot pain and falls.¹⁴ It may also prompt a review of functional status and provide not just a snapshot of the patient's ability to maintain foot hygiene, but an early insight into their risk of overall decline and frailty.

Learning points

- ▶ Inability to perform foot care and maintain foot hygiene is a common, yet often overlooked sign of decreased ability to complete activities of daily living in an older adult.
- ▶ Clinicians caring for older adults, especially those in primary care and general internal medicine settings, should examine the patient's feet at least annually.
- ▶ Early detection of foot problems can prompt simple and effective treatments and may serve as an indicator of ability to meet care needs, risk of frailty and falls.

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REFERENCES

- 1 Barr ELM, Browning C, Lord SR, *et al*. Foot and leg problems are important determinants of functional status in community dwelling older people. *Disabil Rehabil* 2005;27:917–23.
- 2 Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society. Summary of the updated American geriatrics Society/British geriatrics Society clinical practice guideline for prevention of falls in older persons. *J Am Geriatr Soc* 2011;59:148–57.
- 3 Menz HB, Auhl M, Spink MJ. Foot problems as a risk factor for falls in community-dwelling older people: a systematic review and meta-analysis. *Maturitas* 2018;118:7–14.
- 4 Menz HB. Biomechanics of the ageing foot and ankle: a mini-review. *Gerontology* 2015;61:381–8.
- 5 Thomas JL, Christensen JC, Kravitz SR, *et al*. The diagnosis and treatment of heel pain: a clinical practice guideline-revision 2010. *J Foot Ankle Surg* 2010;49:S1–19.
- 6 Gupta AK, Versteeg SG, Shear NH. Onychomycosis in the 21st century: an update on diagnosis, epidemiology, and treatment. *J Cutan Med Surg* 2017;21:525–39.
- 7 White EG, Mulley GP. Footcare for very elderly people: a community survey. *Age Ageing* 1989;18:275–8.
- 8 Ebrahim SB, Sainsbury R, Watson S. Foot problems of the elderly: a hospital survey. *Br Med J* 1981;283:949–50.
- 9 Kelly JC, Groarke PJ, Flanagan E, *et al*. Foot and ankle surgery—the Achilles heel of medical students and doctors. *Foot* 2011;21:109–13.
- 10 Bowling A, Grundy E. Activities of daily living: changes in functional ability in three samples of elderly and very elderly people. *Age Ageing* 1997;26:107–14.
- 11 Ziaic MN, Walker A. Nail abnormalities associated with systemic pathologies. *Clin Dermatol* 2013;31:627–49.
- 12 NICE. *Surveillance of falls in older people: assessing risk and prevention (NICE guideline CG 161)*, 2019.
- 13 Lee R. The CDC's STEADI initiative: promoting older adult health and independence through fall prevention. *Am Fam Physician* 2017;96:220–1.
- 14 James K, Orkaby AR, Schwartz AW. Foot examination for older adults. *Am J Med* 2021;134:30–5.
- 15 Sherman FT. Socks/stocking on sign. *Geriatrics* 2007;62:9–10.
- 16 Kelsey JL, Procter-Gray E, Nguyen U-SDT, *et al*. Footwear and falls in the home among older individuals in the mobilize Boston study. *Footwear Sci* 2010;2:123–9.
- 17 Sharma S, Kerry C, Atkins H, *et al*. The Ipswich touch test: a simple and novel method to screen patients with diabetes at home for increased risk of foot ulceration. *Diabet Med* 2014;31:1100–3.
- 18 Orkaby AR, Schwartz AW. Toenails as the "hemoglobin A1c" of functional independence—beyond the polished wingtips. *JAMA Intern Med* 2018;178:598–9.
- 19 Menz H. *Foot problems in older people: assessment and management*. 1 edn. Churchill Livingstone, 2008.

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