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SCIENTIFIC ARTICLE

High-resolution ultrasonography in assessment of nail-related disorders

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Abstract
Objective Disorders of the nail can pose a diagnostic challenge, and non-invasive imaging is frequently required to clarify diagnosis and delineate anatomy pre-operatively. We explored the use of high-resolution ultrasonography in the assessment of patients with nail disorders attending orthopaedic hand clinics.
Methods A search of a university teaching hospital musculoskeletal radiology database identified 36 patients (mean age 54.2 years) where ultrasonography was used to assess nail-related disorders between April 2003 and January 2007. Clinical, surgical and histological findings were correlated in these cases with ultrasound reports.
Results Ultrasound findings correlated with the provisional diagnosis in 20 (61%) of 33 patients and provided a diagnosis in 3 patients where a provisional diagnosis was unavailable. In 7 of the 13 cases where the clinical diagnosis differed from ultrasound findings, a lump originally diagnosed as cystic in origin was shown to be solid on ultrasound. Different nail pathologies showed different characteristics on ultrasonography, including differences in vascularity, echogenicity, changes in nail structure/shape and extension into the nail bed, matrix, fold or evidence of bony erosion. The ultrasound findings correlated with histological analysis and intra-operative assessment in 10 of 15 patients who underwent operative treatment.
Conclusion Ultrasound provides important information on the anatomy of the nail apparatus and can differentiate solid and cystic lesions. It can be used as a diagnostic tool and can therefore help in pre-operative planning of nail-related disorders. In our series ultrasound supported or improved upon the clinical diagnosis in 31 (86%) out of the 36 patients presenting with nail-related disorders.

Keywords Ultrasonography · Nail-related disorders

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Introduction

Management of nail bed and nail-related pathology has traditionally relied on clinical examination, scrapings or biopsies of the nail and underlying skin [1]. The presence of the nail plate and the complex anatomy of the nail bed make it difficult to accurately identify the pathology or exactly define the involvement of the different elements of the nail apparatus. Certain nail conditions, such as subungual glomus tumours, may be too small to biopsy, and incomplete surgical excision can lead to recurrence [2]. In such cases non-invasive imaging can aid accurate assessment of the anatomy of the nail apparatus before surgery. Options include radiography, magnetic resonance imaging (MRI), computerised tomography (CT) or ultrasound scanning. Of these methods, ultrasound is readily available and is capable of differentiating various echogenicities within the nail apparatus [3] (Figs. 1 and 2) with characteristic sonographic appearances seen in benign tumours and pseudo tumours, psoriasis, cysts and vascular abnormalities [3, 4]. Owing to advances in high-frequency imaging and small

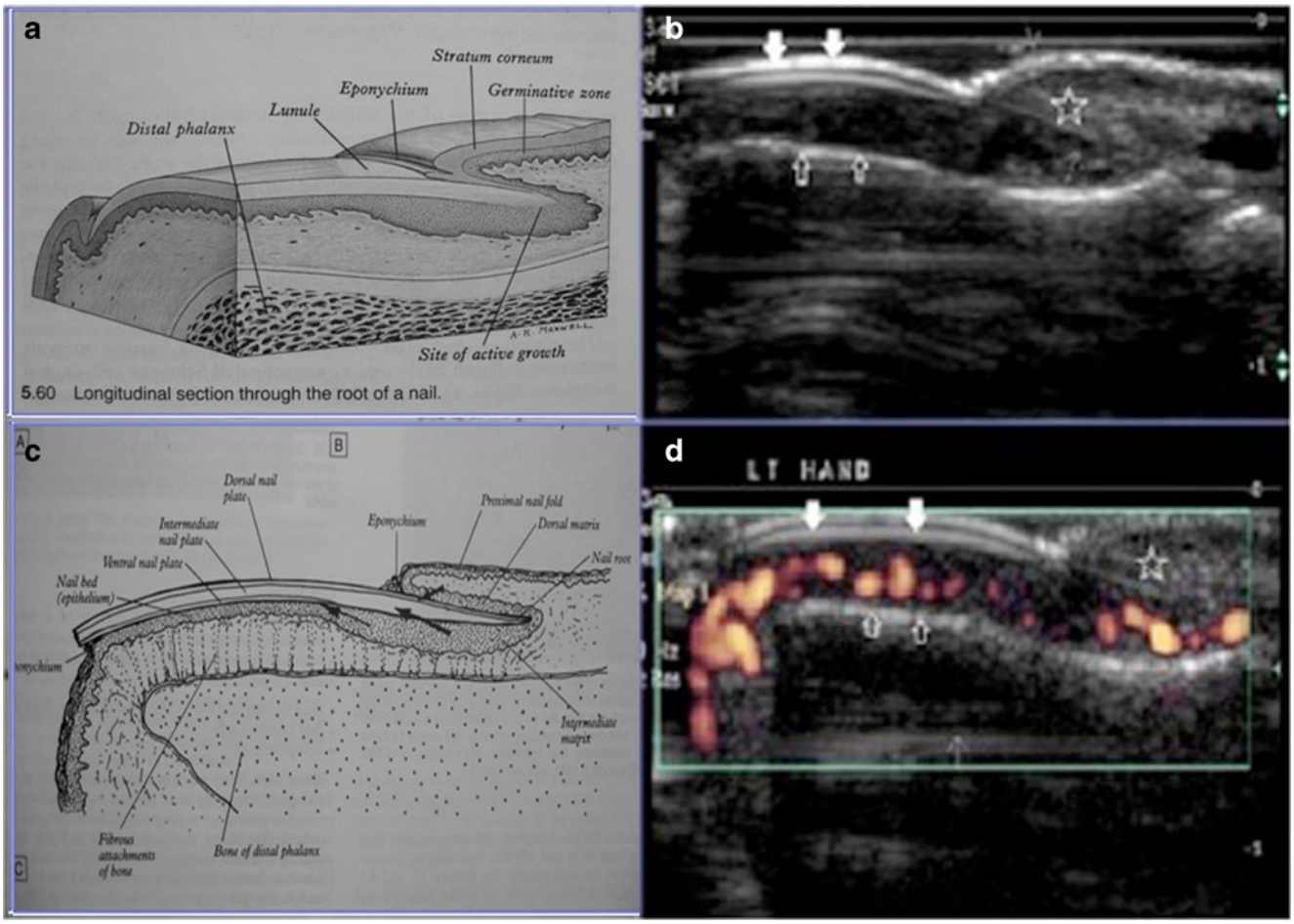

Fig. 1 Normal anatomy. **a** Line diagram showing sagittal section of nail plate, nail fold and normal bone. **b** Sagittal ultrasonographic image through the nail complex demonstrating smooth and clearly defined superficial and deep surface of the normal nail plate. Uniform intermediate echogenicity from underlying nail bed is seen. Origin of the nail plate is seen within the normal thickness of the germinal matrix. Proximal subcutaneous fat in the nail fold demonstrates higher but uniform echogenicity compared to that of the nail bed. The smooth surface of the dorsum of the distal phalangeal cortex is clearly seen. **c** Line diagram demonstrating anatomy of nail plate, nail fold and normal bone. **d** Sagittal power Doppler mode ultrasound image demonstrates normal vascularity of the nail bed. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium

portable devices, ultrasonography has become an increasingly popular method of assessing nail-related disorders. Ultrasound carries no risk of radiation, has no contraindications and is cheaper and less time consuming to perform, but its role as a primary imaging method in nail-related disease is not fully established. This study explores the use of high-resolution ultrasonography in the assessment of patients with nail disorders attending hand clinics in an attempt to relate clinical, sonographic and histological findings and define the benefits of this imaging modality.

Methods

The musculoskeletal radiology database of a university hospital was searched to identify patients who had ultrasonography for nail-related disorders between April 2003 and January 2007. The computerised radiology information system (CRIS) database was searched for ultrasonographies performed by a single operator. The search term ‘nail’ was used, and 36 patients were identified. Each patient presented to a hand clinic before investigation. A review of the clinical notes provided data on the nature of the presenting complaint and provisional diagnosis. We also collected the surgical findings and histological diagnoses on patients who had surgery or had a biopsy. All information was obtained from the reports, and no attempt was made to assess the images retrospectively. We looked at the outcome of these patients in relation to the ultrasound reports and clinic letters.

A single experienced musculoskeletal radiologist using a HD5000 ATL Phillips machine performed ultrasonographic examinations using linear array high-resolution probes (5–17 MHz) or the hockey stick probe (10–17MHz). Routine examination included assessment of the nail, germinal matrix, nail bed, nail fold and the surrounding soft tissue. The attributes of the lump studied by ultrasound were size and shape, nature

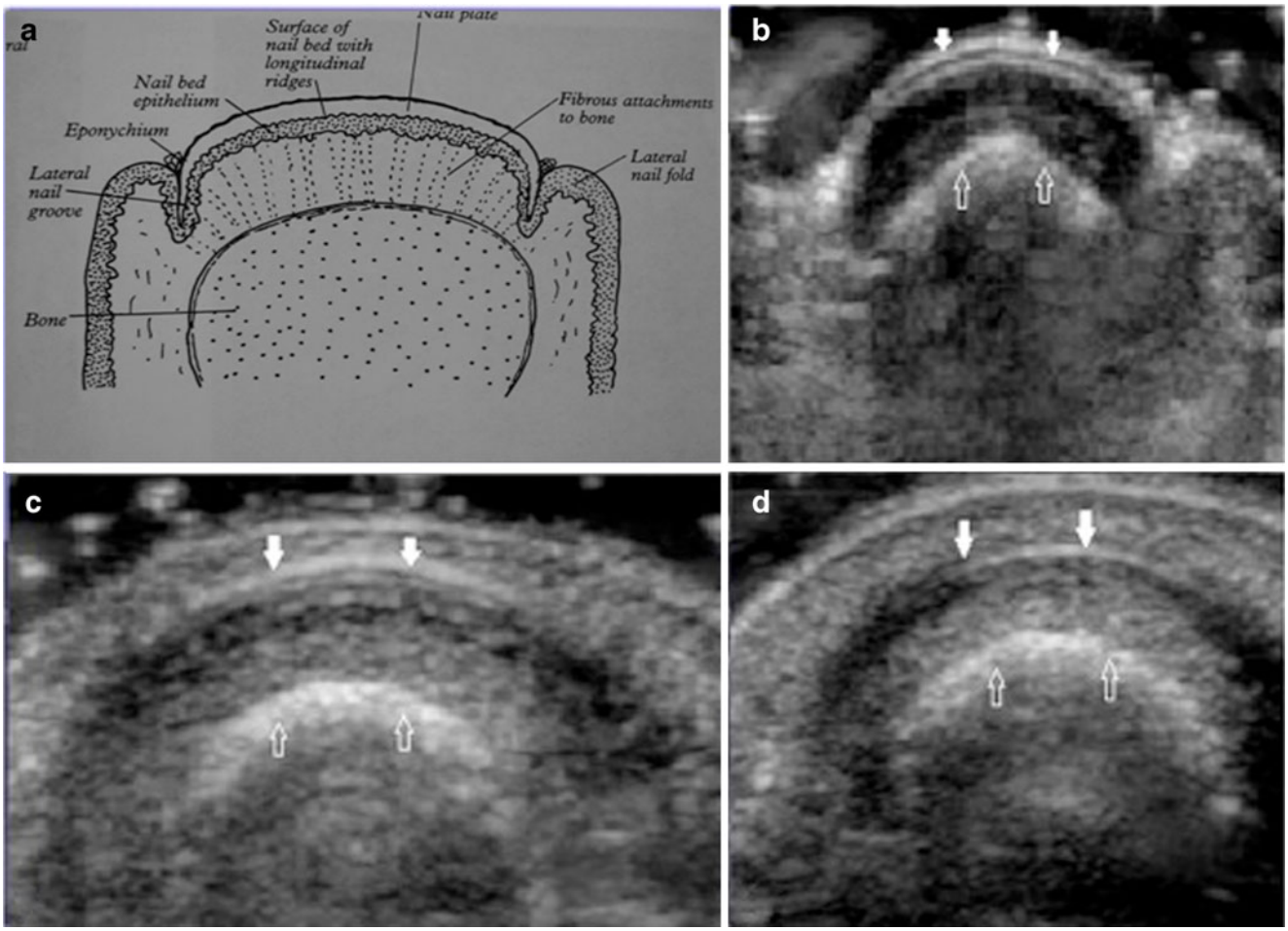

Fig. 2 Normal anatomy. **a** Transverse line diagram illustrating the lateral nail fold, nail groove, nail plate and the nail bed. **b** Transverse sonographic image demonstrating that the normal thickness germinal matrix is of low echogenicity compared to that of the surrounding nail fold fat. Smooth margins of the skin, germinal matrix, and underlying cortex can be seen. **c** Transverse image just distal to the nail fold demonstrates the origins of the lateral nail fold and the eponychium. **d** Transverse image through the mid nail plate demonstrates the normal lateral nail fold on both sides and the smooth preserved superficial and deep margins of the nail plate. The homogeneous echogenicity seen from the nail bed shows the well defined underlying bone cortex. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx

(solid, cystic), margins (defined, ill defined) and its vascularity. The effect on surrounding structures was identified by documenting the following attributes: defect in bone, defect in the nail structure, extension into the matrix, nail fold, nail bed, underlying bone, tendon and ligament. The distal interphalangeal joint and the distal attachments of the extensor and flexor tendons were also assessed. Colour and power Doppler studies were used when needed. Dynamic examination added information about tethering/deep attachment of any lump. It is a routine practise to look for all these attributes, but the report mentions only the relevant positive and negative findings.

Results

Between April 2003 and January 2007, 3,936 ultrasound examinations were performed for musculoskeletal indications. Of the 1,311 (33%) assessments undertaken for hand and wrist disorders, 36 (0.9%) were for nail-related disorders. Thirteen patients were men and 23 women with a mean age of 54.2 years (range 14 – 80 years). The two commonest digits assessed were the middle (47%) and index (25%) fingers.

Twenty-seven of the 36 patients presented with a ‘lump’ in isolation or with associated pain. The remaining patients presented after an injury or with infection. A senior surgeon examined each patient at initial consultation, and a provisional diagnosis was made for 33 (92%) of the 36 patients. Three patients had no provisional diagnosis. One patient presented with two nail lumps with two different provisional diagnoses, and 11 patients had a nail deformity when imaged.

Ultrasound findings correlated with the provisional diagnoses in 59% (20 of 34) of the cases (Table 1). In 14 cases ultrasonography either refined the provisional clinical diagnoses or provided a diagnosis in cases where clinical

Table 1 Summary of patient characteristics and study results

Patient	Age (years)	Sex	Presenting symptom	Finger	Provisional diagnosis	Ultrasonography diagnosis	Nail deformity	Operation	Histology	Outcome	Ultrasound yield correct diagnosis
1	78	F	Lump	Index	Ganglion	BNBC	N	-	-	Resolved	Y
2	67	M	Lump	Middle	Cyst	BNBC	Y	-	-	Partially resolved	Y
3	55	F	Lump	Middle	Cyst	BNBC	N	-	-	Partially resolved	Y
4	51	F	Lump	Thumb	Foreign body*	BNBC*	Y	Excision	-	Resolved	Y
5	63	F	Lump and pain	Middle	Cyst	BNBC	N	-	-	Partially resolved	Y
6	60	F	Lump	Thumb	Cyst	Ganglion	N	-	-	Partially resolved	Y
7	51	F	Lump	Index	Cyst*	OA*	N	-	-	Resolved	Y
8	75	F	Lump and pain	Middle	-	GNT	N	Excision	Glomus tumour	Resolved	Y
9	32	F	Lump	Middle	GCT	GCT	N	Excision	GCT	Resolved	Y
10	43	M	Lump	Ring	-	ID	N	-	-	Partially resolved	Y
11	55	F	Lump and pain	Index	GCT	GCT	N	Excision	GCT	Resolved	Y
12	60	M	Lump and pain	Middle	Cyst*	ID*	N	-	-	Resolved	Y
13	73	M	Lump	Middle	GCT	GCT	N	Excision	GCT	Resolved	Y
14	80	M	Lump and pain	Middle	Miscellaneous	Miscellaneous	N	Excision	GCT	Resolved	N
15	65	F	Lump and pain	Middle	Lump 1: mucous cyst, lump 2: GCT*	GCT*	N	-	-	Resolved	Y
16	14	F	Lump	Index	Infection*	Glomus tumour*	N	Excision	Granuloma	Resolved	N
17	63	F	Lump	Index	Miscellaneous*	FB*	Y	Excision	Benign ganglion	Resolved	N
18	49	M	Trauma	Ring	-	Miscellaneous	N	Exploration and debridement	-	Resolved	Y
19	40	F	Infection	Thumb	Infection	Infection	Y	-	-	Resolved	Y
20	27	M	Lump and pain	Ring	Infection	Infection	N	-	-	Resolved	Y
21	51	M	Infection	Middle	Infection	Infection	Y	-	-	Resolved	Y
22	16	F	Trauma	Middle	Trauma	Trauma	Y	1st op: refashioning of nail bed and germinal matrix, 2nd op: revision of nail bed	-	Partially resolved	Y
23	66	M	Trauma	Little	Miscellaneous*	FB*	N	Exploration and debridement	Granuloma	Partially resolved	N
24	47	F	Lump and pain	Middle	Cyst*	NAD*	N	-	-	Resolved	Y
25	64	F	Lump	Index	Cyst*	OA and cyst*	N	-	-	Resolved	Y
26	63	M	Lump and pain	Middle	Cyst*	FB*	Y	-	-	Partially resolved	Y
27	55	F	Lump and pain	Little	OA	OA	N	-	-	Not known	Y
28	56	F	Infection	Ring	Infection	Infection	Y	-	-	Not resolved	Y
29	57	F	Lump	Index	Cyst*	BNBC*	Y	Excision	-	Partially resolved	Y

Table 1 (continued)

Patient	Age (years)	Sex	Presenting symptom	Finger	Provisional diagnosis	Ultrasonography diagnosis	Nail deformity	Operation	Histology	Outcome	Ultrasound yield correct diagnosis
30	55	M	Lump and pain	Middle	Cyst*	Miscellaneous*	N	-	-	Partially resolved	Y
31	62	F	Lump and pain	Middle	Cyst*	Glomus tumour*	N	-	-	Partially resolved	Y
32	50	F	Trauma	Middle	Miscellaneous*	FB*	N	-	-	Partially resolved	Y
33	61	F	Trauma	Middle	Lump, FB	FB	N	Excision	-	Partially resolved	Y
34	44	M	Trauma	Index	Trauma	Trauma	Y	-	-	Partially resolved	Y
35	72	F	Lump and pain	Index	Infection*	Glomus tumour*	N	Excision	Glomus tumour	Resolved	Y
36	31	M	Lump	Thumb	Miscellaneous*	Glomus tumour*	Y	Excision	Superficial acral fibromyxoma	Resolved	Y

BNBC Benign nail bed cyst, *OA* osteoarthritis, *ID* implantation dermoid, *GCT* giant cell tumour, *FB* foreign body, *NAD* no abnormality detected

Asterisks indicate discrepancies between provisional/ultrasound and histological findings

assessment was equivocal, and in the three patients in whom no provisional diagnosis was made, ultrasonography yielded a diagnosis. In two of these three patients, ultrasound diagnosis was confirmed with subsequent histological analysis, and in one patient the condition resolved without surgical intervention. In 7 (54%) of the 13 patients with a provisional diagnosis of cystic lump, ultrasonography suggested the lump was solid rather than cystic in nature. Histological analysis provided confirmation of this for five cases.

Fifteen patients (42%) required surgical intervention: 12 had their lumps excised, 2 underwent exploration and debridement, and 1 patient had the nail bed refashioned. Ten (83%) of 12 excised lumps underwent histological analysis, and the reports were reviewed. Six of 10 ultrasonographic diagnoses were confirmed on histology. This included three giant cell tumours of the tendon sheath and three glomus tumours. Histology did not confirm the ultrasonographic findings in four patients, two of whom had a granuloma instead of the suspected glomus tumour, and two had a benign cyst instead of the suspected giant cell tumour of the tendon sheath. These four cases were assessed during the early part of the radiologist's learning curve, and as the swellings were found to be non-compressible, they were thought to be giant cell tumour or glomus tumour on ultrasound assessment rather than benign cysts. Four of the five patients who had no biopsies taken had the same intra-operative diagnosis as that indicated by ultrasonographic findings with two cysts (ganglions), one foreign body and one related to trauma (refashioning of nail matrix). One patient who had no abnormal intra-operative findings had no definite ultrasound diagnosis. Eleven patients (73%) had complete resolution and four (27%) had partial resolution of their symptoms after surgery. Of the patients treated conservatively only one patient, with a diagnosis of chronic nail infection, reported no improvement in symptoms. One patient was lost to follow-up after ultrasound examination had identified osteoarthritic changes as the cause of a painful lump.

Overall ultrasound examination yielded an accurate diagnosis in 31 out of 36 (86%) patients, 21 of whom did not need surgery and 15 who did. Table 1 summarises all the patients' results.

Discussion

Although some common disorders of the nail, such as a mucous cyst, are easy to identify, other disorders of the nail can pose a diagnostic challenge. A spectrum of pathological processes can lead to symptomatic nail complaints, but deformation of the nail plate or a change in colour may be the only visible clinical manifestations [1], making it difficult to arrive at a definite diagnosis. When clinical examination is equivocal,

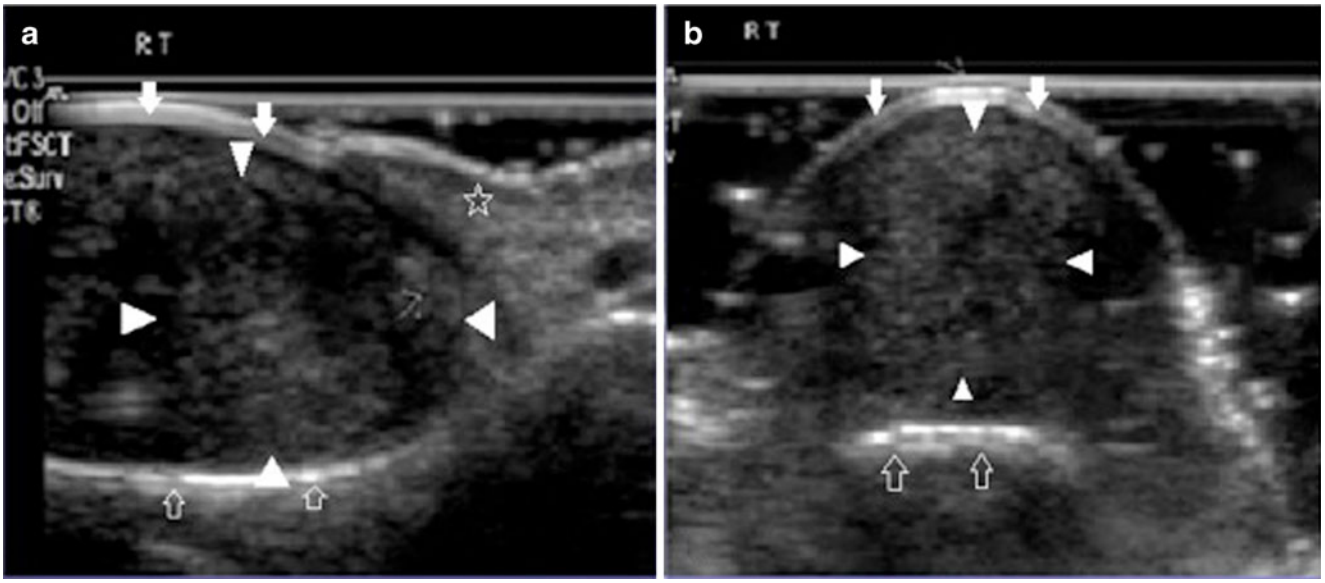

Fig. 3 Superficial acral fibromyxoma. **a** Sagittal ultrasonographic image through the nail complex demonstrating a large, oval lump under the nail plate at the base of the nail near the germinal matrix which is not infiltrated but stretched. The solid well defined mass has an intermediate but uniform echogenicity. **b** Transverse sonographic image demonstrates that the lump has displaced and lifted up the nail plate, but there is no deformity of the plate. Histology showed features of a superficial acral fibromyxoma. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium. *Arrowheads* indicate the extent of the lesion

non-invasive imaging techniques may be needed to aid diagnosis and assess the anatomy of the nail apparatus.

Plain radiography has traditionally been the complementary imaging method for the nail and distal phalanx but provides little information on soft tissue structures [5]. Magnetic resonance imaging (MRI) and, less commonly, computerised tomography (CT) can be used in the assessment of nail pathology. With advances in transducer technology, ultrasonography has become a useful adjunct in the diagnosis and management of select group of patients with nail disease [6]. The nail apparatus is composed of tissues of varying echogenicities well suited to ultrasonographic assessment [3]. Conditions such as

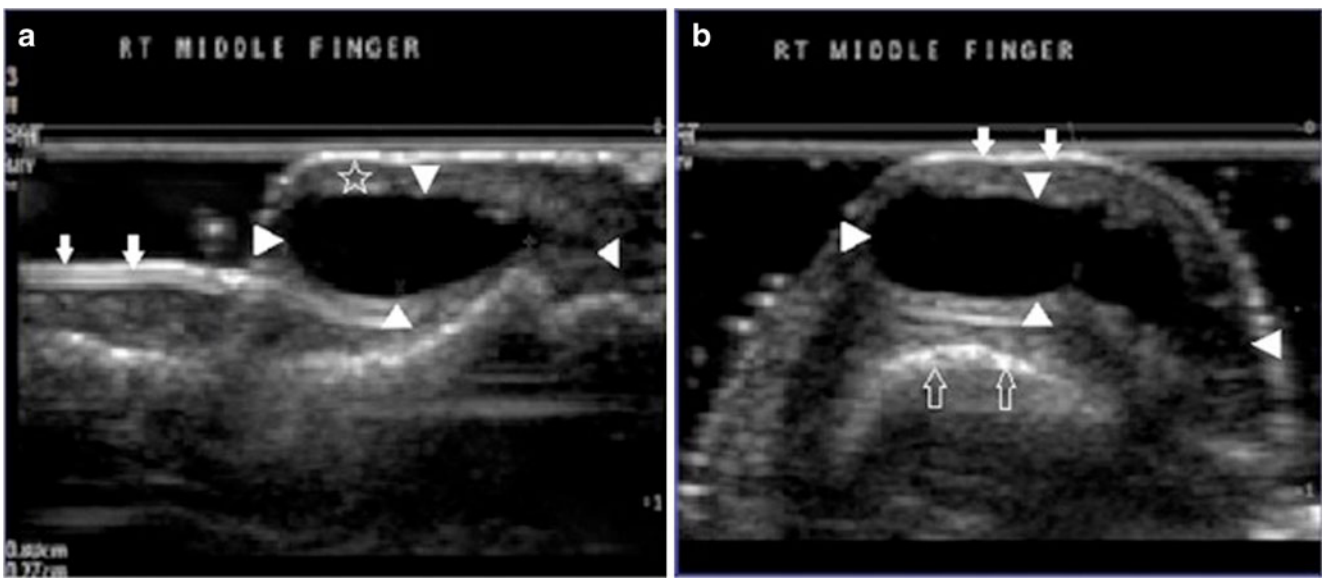

Fig. 4 Mucous cyst. Sagittal (**a**) and transverse (**b**) images of the proximal nail fold demonstrate the partly compressible cystic lesion with well defined margins and extending from the adjacent distal interphalangeal joint. There is compression and deformity of the germinal matrix and the adjacent nail plate. Both layers of the nail plate are visible and smooth. Mucous cyst can be multiloculated and can extend into adjacent structures with no vascularity. The larger cysts can cause thinning of the overlying skin. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium. *Arrowheads* indicate the extent of the lesion

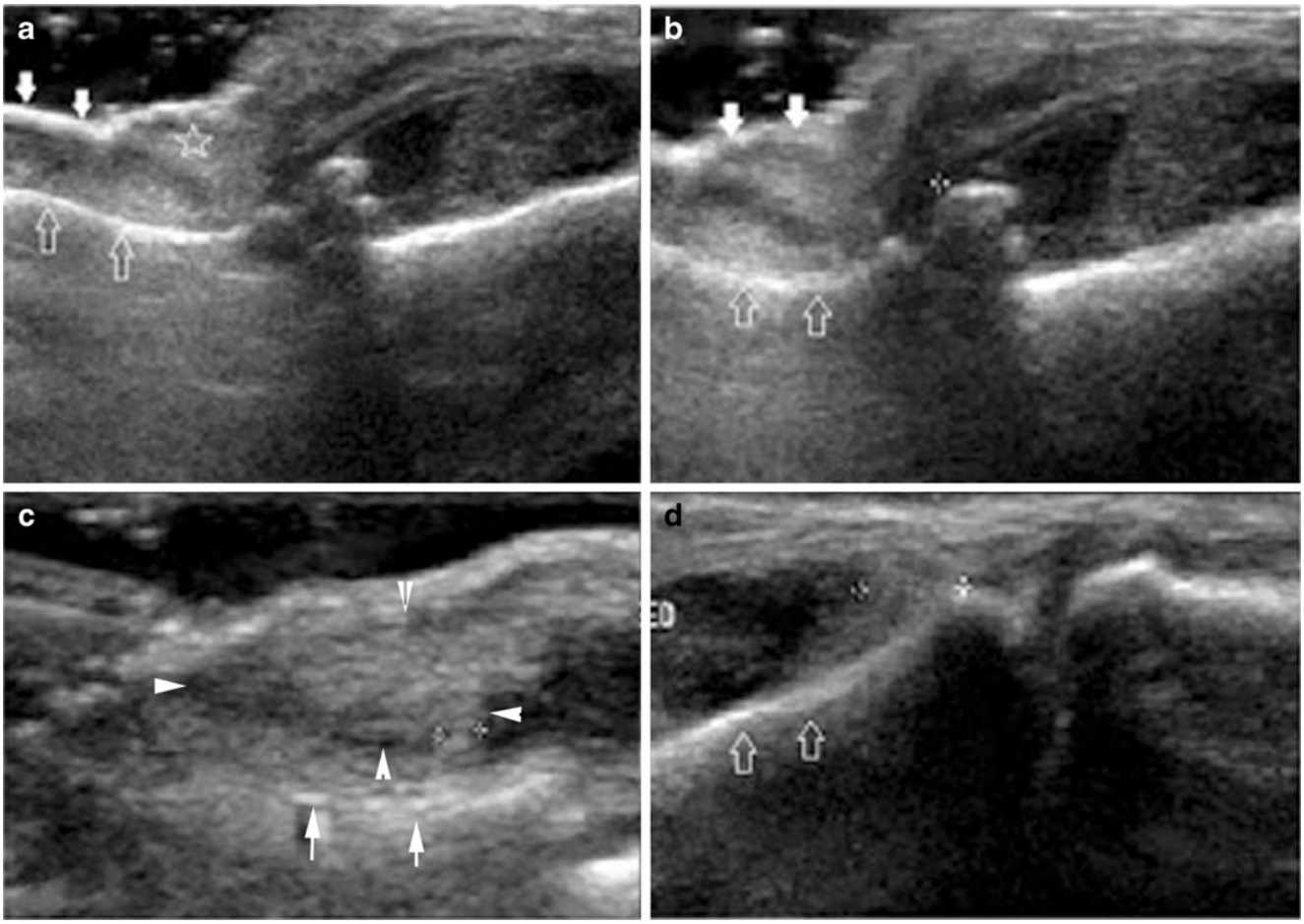

Fig. 5 Giant cell tumour. Ultrasound shows a giant cell tumour of the right index finger. **a**, **b** Linear array 5–17 MHz probe sagittal image demonstrates the lump at the base of the nail overlying the distal interphalangeal joint. The lump can be seen extending into the proximal nail fold. The overlying skin appears stretched and thin. Solid lump has inhomogeneous echogenicity but partial attenuation of the echogenicity so the bone surface can be seen. **c** High resolution linear array 7–15 MHz sagittal image demonstrated the proximity of the tumour margin to germinal matrix within the proximal nail fold and the deeper margin of the lump superficial to the common extensor tendon. It appears to be arising from the distal interphalangeal joint with an osteophyte. **d** A clear plane is still visible between the tumour margin and the adjacent structures. Dynamic assessment added further information to exclude any occult tethering. The lobulated nature of the tumour and inhomogeneous but predominantly intermediate echogenicity is also seen on the superficial surface. This lesion is usually not hypervascular. *Arrowheads* indicate the extent of the lesion. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium

glomus tumours, cysts, radiologically occult bone erosions and radio-transparent foreign bodies can be detected by ultrasonography [5] and the site and dimension of the lesions defined. It may also be used to assess systemic diseases with nail manifestations, such as systemic lupus erythematosis, systemic sclerosis and psoriasis. In psoriasis, ultrasonography is used to monitor disease progression [3]. Ultrasound is a non-invasive, non-ionizing method that is readily available. It is capable of identifying subungual glomus tumours as small as 2–3 mm in diameter [7, 8] and when supplemented with colour duplex sonography has a 100% identification rate for glomus tumours allowing complete resection with no long-term recurrence at 6 years after surgery [8] (Figs. 3, 4, 5, 6 and 7). In patients presenting with injury, ultrasound can detect the site and extension of lacerations, dislocated nail fragments and disruption of the extensor tendon at its insertion into the distal phalanx [3]. Similarly, post-traumatic sequelae, such as epidermoid cysts, can be identified along with elements of fibrous tumours and vascular lesions [5, 9]. Magnetic resonance imaging can provide more accurate anatomical definition and differentiation of nail tumours [9, 10], including information on the histological type of glomus tumours [7], but its expense prohibits routine use [10]. An MRI scan can cost nine times more than an ultrasound scan [8]. It has also been suggested that MRI should only be employed in the assessment of glomus tumours when the clinical diagnosis is in doubt [11].

In our study, clinical assessment proved accurate for only 20 of the 34 (59%) provisional clinical diagnoses in 33 patients. In three patients, no provisional diagnosis was available. Ultrasound provided a definitive diagnosis in these three patients but also improved upon the provisional diagnoses in 13 other patients. Overall ultrasound yielded an

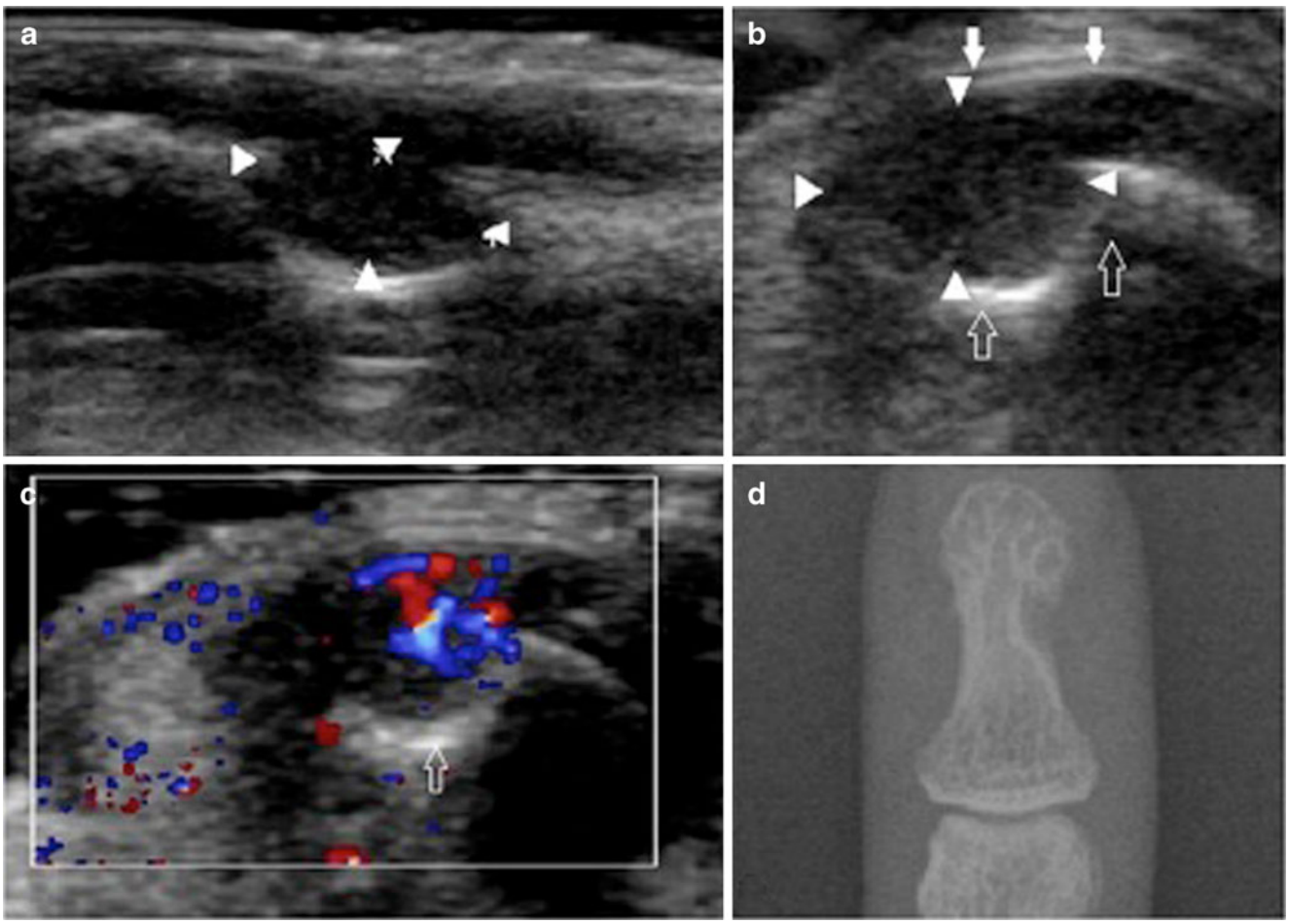

Fig. 6 Glomus tumour. **a** Sagittal ultrasonographic images demonstrate a solid ill-defined lump, which has eroded into the distal phalanx. **b** Transverse ultrasonographic image demonstrates a lump with intermediate echogenicity eroding on one side of the bone but the nail structure not changed. It reveals the site and the extent of the erosion and the spread of the swelling into the surrounding structures. **c** The Doppler images demonstrate the increased vascularity within the lesion. Histology confirmed a glomus tumour. **d** Plain radiograph demonstrated the erosion of the distal phalanx, but the soft tissue swelling could be demarcated with accuracy with ultrasound imaging. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium. *Arrowheads* indicate the extent of the lesion

appropriate diagnosis in 31 out of 36 (86%) patients. Histological analysis did not confirm four of the ultrasound diagnoses, and in one patient the underlying complaint of post-traumatic lump remained unclear despite imaging and surgical exploration. Fortunately this patient reported complete resolution of symptoms. These findings are in keeping with those of other studies advocating the use of ultrasonography in the assessment of nail lumps [2–4, 8, 12].

Our findings demonstrate that ultrasound is a valuable imaging method in assessing different nail pathologies. It is well suited to assess the different tissue planes of the nail apparatus and can accurately differentiate cystic and solid lesions. Ultrasonography provided additional information that could not be obtained by clinical examination alone. The size of the lesion could be easily measured and the shape outlined. The nature (solid/cystic) and margins (defined/ill defined) of lumps provided further description about the characteristics of the nail pathologies. Increased vascularity was seen in glomus tumours; margins were well defined in all cysts and giant cell tumours but ill defined in glomus tumours. Dynamic assessment could be employed to assess tethering to the tendon especially in those with giant cell tumours or cysts. Defects in the nail structure and anatomical extension into the nail bed, matrix, fold or bony erosion could be studied, particularly in cases of glomus tumour (Table 2). Certain characteristics, including echogenicity, vascularity and extension into surrounding structures could be defined. Ultrasonography is a particularly helpful diagnostic tool and aids pre-operative planning. This can help to prevent unnecessary tissue dissection minimising additional trauma to the nail apparatus and the resulting deformity [8]. It also reduces the risk of incomplete excision of lumps, such as a glomus tumour, which increases the risk of recurrence [2].

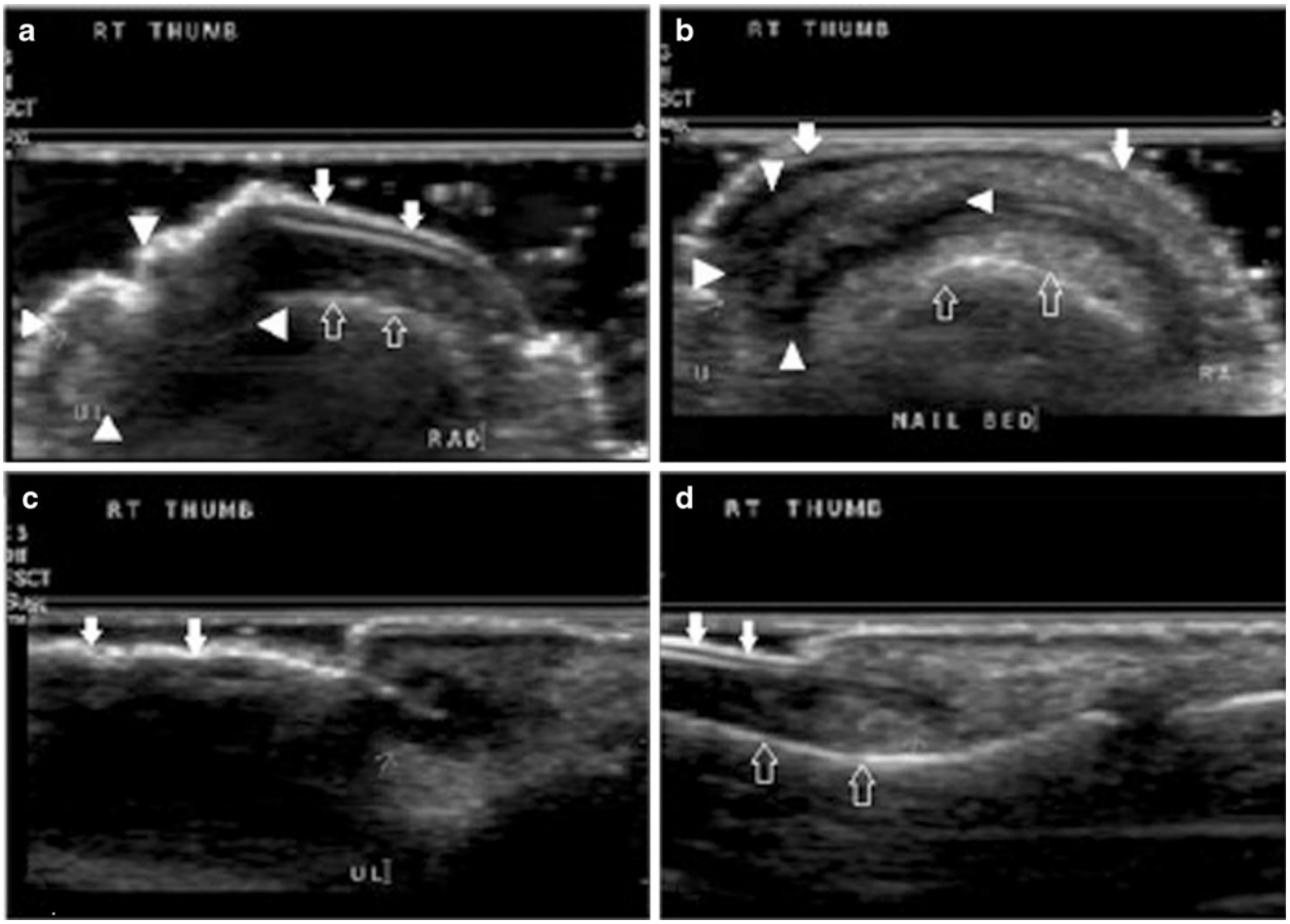

Fig. 7 Infection. Ultrasound shows the right thumb in transverse and sagittal planes showing fungal infection of the nail bed. **a** Transverse image through germinal matrix demonstrating the infected thickened matrix on the ulnar aspect. The overlying nail fold also demonstrates thickening, and the low echogenicity indicates oedema. Distal attenuation leads to ill-defined deeper cortical margin. Normal anatomy is well demonstrated on the radial side from skin surface to the bone. **b** Transverse image just distal to the nail fold obtained with coupling to get standoff demonstrated normal anatomy on the radial aspect from the nail surface to the bone. Both superficial and deep surfaces are clearly seen as parallel white lines. Infected deformed thickened pitted nail is seen on the ulnar aspect. Cortical bone surface is not seen due to attenuation by the thickened nail and tissue. *Solid arrow* Nail plate, *open arrow* dorsal aspect of distal phalanx, *star* eponychium. *Arrowheads* indicate the extent of the lesion. **c** Sagittal plane ulnar side image demonstrating infected germinal matrix with surface irregularity and pitting of the nail plate, which causes distal attenuation so that the underlying tissues can not be seen. **d** Normal uninfected radial side of the nail demonstrating normal germinal matrix that is thinner compared to the other side. Both surfaces of normal nail plate are clearly visible with smooth outline

Ultrasound examination was found to be particularly useful in differentiating tissue densities. It helped distinguish between solid tumours and fluid collection due to infection; allowed clear definition of the margins of lesions; and delineated the size, shape, and extent of recurrent lesions, permitting local staging and aiding in pre-operative planning (Table 2).

There are limitations in this study. The ultrasound operator was not blinded, and the provisional diagnosis was available at the time of the scan. Knowledge of the provisional diagnosis could have influenced the imaging report. It is a retrospective study with small numbers, and the diagnosis group includes a mixture of clinical diagnosis with surgical and nonsurgical patients.

Conclusion

Ultrasound represents an important imaging adjunct in the assessment of select cases with nail pathology where the diagnosis is unclear. It is readily available and can be performed quickly with no discomfort and minimal inconvenience to the patient. Ultrasound can provide important information on the anatomy of the nail, nail fold and germinal matrix and can be used as a diagnostic tool and in pre-operative planning. It carries no risk of radiation, is cheaper to perform than MRI and can be used for long term follow-up of disorders of the nail and associated anatomical structures and tissues.

Table 2 A comparison of lump characteristics on ultrasonography in common conditions

Characteristics of lump studies by ultrasonography	Cyst	Acral fibromyxoma (Fig. 3)	Giant cell tumour	Glomus tumour
Size[a] and shape	Variable; may be single well defined (5), multiloculated (3)	Large; oval shape (1)	Variable; unilobulated (2), multilobulated (2)	Variable (5)
Nature (solid, cystic)	Cystic (8)	Solid (1)	Solid (4)	Solid (5)
Echogenicity[b]	Hypoechoic (5), uniform (3)	Intermediate but uniform signal (1)	Inhomogeneous solid lump (4)	Intermediate signal (4), hypoechoic (1)
Margins (defined, ill defined)	Well defined (8)	Well defined (1)	Well defined margin with irregular outgrowth (4)	Ill defined (4), well defined (1)
Vascularity	Increased vascularity (0)	Increased vascularity (0)	Increased vascularity (0)	Increased vascularity (3)
Dynamic assessment for tethering	Tethering (0)	Difficult to assess (no tethering present)	Recommended (no tethering present)	Difficult to assess (no tethering present)
Defect in bone	Indentation of the nail from nail fold, causing groove in the nail (3)	Can indent the bone (1)	Local infiltration (2)	Can erode into bone (2)
Defect in nail structure	Shape changes but not the structure (3)	Displacement, no deformity (1)	Local displacement from extrinsic pressure (2)	Changes in nail structure (2)
Extent into matrix, fold, bed, bone, tendon, ligament	Arises from the joint and origin can be identified on sonography (8)	Germinal matrix not infiltrated but stretched (1)	Extends into proximal nail fold with pressure effects (2)	Can erode into the surrounding structures (1)

Number in brackets indicates number of cases with positive characteristic for that given condition

[a] Size: small <1 mm, medium 1–5 mm, large >5 mm

[b] Echogenicity: intermediate: half of the sound is returned back, hypoechoic: minimal sound returns to the probe, hyperechoic: nearly all sound is reflected back to the probe

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