CLINICAL VIGNETTE

Splinter Hemorrhages: Pomegranate Preparation and Other Mechanisms of Injury

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Case Presentation

A 63-year-old male presented for evaluation of new fingernail changes for two weeks. He reported his fingernails developed brownish discoloration in tiny streaks. They initially appeared as fine red lines, resembling blood under the nails, and are now turning purplish yellow. He had not recently used dyes or paint on his fingers. His regular diet included eating one bag of carrots every two weeks, but he denied any yellowish discoloration of the palms. Recently, he had been enjoying pomegranates every two days for the last two weeks.

Past medical history includes hypertension with proteinuria, hypothyroidism, hypercholesteremia, hyperuricemia, thalassemia minor, nephrolithiasis, and toenail onychomycosis. He denied bleeding disorders or easy bruisability and was free of hand pain, trauma, or systemic symptoms. Medications were unchanged and included: benazepril, metoprolol, levothyroxine, atorvastatin, allopurinol, and vitamin D.

On physical exam, he was a well-appearing, thin male. Blood pressure was 131/93 mm Hg, pulse 65/min, respiratory rate 12/min and oxygen saturation 99 % on room air. A complete physical examination was performed and was significant only for the skin exam which revealed: numerous pigmented nevi on the arms, back, and trunk; purplish streaks with surrounding yellowish discoloration under the fingernails of the right hand in the lateral and distal aspects, consistent with splinter hemorrhages; and toenails with onychomycosis. Laboratory evaluation showed normal complete blood count, comprehensive panel, erythrocyte sedimentation rate, anti-nuclear antibodies, and double-stranded DNA.

The following day, the patient was contacted to review his lab work and assess for new symptoms. No new events had occurred overnight. Taken together the data did not suggest systemic disease including autoimmune, infectious, or vascular etiologies. On further questioning regarding possible changes to his routine such as trauma to his fingertips, he recalled that he had been peeling and deseeding pomegranates every two days and using his fingertips with substantial force to peel the pomegranates and retrieve the seeds. It was then concluded that the splinter hemorrhages were a result of local trauma from preparing the pomegranates. Strict return precautions were provided should he develop any new/systemic symptoms, and there were no subsequent complaints. Within two months the splinter hemorrhages resolved without future recurrence.

Discussion

While this patient was diagnosed with traumatic splinter hemorrhages resulting from forcefully peeling and deseeding pomegranates, the presence of splinter hemorrhages initially elicits suspicion for a myriad of diseases of varying severity, and the differential diagnosis is extensive and at times ominous. In fact, splinter hemorrhages were first described in bacterial endocarditis in 1920 by the prominent English physician Sir Thomas Horder who observed "a minute petechia in the form of a vivid linear splash of red at the side of the bed of a finger nail."[1,2] In 1923, Dr. George Blumer, the eminent clinician and former Dean of Yale Medical School, went on to report "curious subungual linear hemorrhages which look exactly like a splinter under the nail in patients with endocarditis." For three decades thereafter, splinter hemorrhages were almost pathognomonic for bacterial endocarditis, until 1958 when Platts and Greaves identified that these lesions occurred in many other illnesses.[2]

Splinter hemorrhages appear as reddish-brown to black non-blanching, longitudinal,[1-3] mm linear marks that develop beneath the nail plate, occurring more often in the fingernails than toenails.[3,4] Rupture or thrombosis of the longitudinally oriented nail bed capillaries causes blood to extravasate and become encased in subungual keratin.[3] Though primarily asymptomatic, one study of healthy adults with atraumatic recurrent splinter hemorrhages reported that the fresh lesions could be associated with tenderness and burning sharp pain for a few days.[5]

Most commonly, the hemorrhages occur in the distal one-third of the nail and adhere to the nail plate so that they move acrally when the nail grows. If they become anchored to the nail bed, they may stay fixed to the site of origin. In healthy individuals, they usually appear in one digit,[5] and in manual workers, the thumb and the index finger more commonly are affected. In women who present with splinter hemorrhages involving more than one fingernail, underlying systemic disease must be considered, and lesions in these patients may be red and proximal.[4,6] Splinter hemorrhages in elderly patients usually are black and distal and are largely precipitated by trauma, often associated with the use of walking aids.[7] Men and darkly-complexioned individuals have splinter hemorrhages more frequently than their counterparts.[4,6]

The finding of splinter hemorrhages generates an extensive differential diagnosis, and a careful history and physical examination are essential to narrow the clinical possibilities.[8]

Nail trauma is the most common cause representing 20 percent of all cases,[9] and a comprehensive social history is imperative to identifying the insult. Questions should focus on occupational duties, hobbies (playing percussion instruments, gardening), housework, personal habits (use of acrylic nails, personal tics), and sports activities.[5] Other etiologies include dermatoses (psoriasis, lichen planus), systemic diseases (connective tissue disease, vasculitis), infectious diseases (onychomycosis, endocarditis--in which there is a 39 % prevalence of splinter hemorrhages[10]), chronic kidney disease, drug effects, and idiopathic causes.[9] Eliciting a history of fever, rash, arthralgias and dyspnea may reveal infectious, autoimmune, or thromboembolic disease. Review of both prescribed and over-the-counter medications (tetracycline, terbinafine, aspirin[11]) is important in identifying drug-induced causes. During the physical examination, patients should be evaluated for findings associated with other diseases such as nail pitting in psoriasis, or Janeway lesions, Roth spots, and Osler's node seen in endocarditis.

In a 2016 review, Haber et al examined all of the available literature citing splinter hemorrhages and their etiologies from 1920 and onwards. **Table 1**[5,8,12] summarizes the etiologies of splinter hemorrhages.[8]

While the mechanisms of injury causing splinter hemorrhages are not completely understood, they are related to the underlying pathophysiology of the associated disease. In general, there is disruption of the fragile spiral arteries located at the end of the stratum granulosum.[8] These vessels have a longitudinal axis that parallel the grooves and ridges the nail plate, leading to the appearance of tiny petechial splinters.[3]

Trauma can disrupt the vessels through activities of daily living, sports, housework, playing percussion instruments, or tics.[5] Other mechanisms include vascular wall inflammation (sepsis, chronic meningiococcemia, vasculitis), tissue inflammation that surrounds the vessels (psoriasis, lichen planus), local microthrombosis (antiphospholipid syndrome, Wegener's disease),[8] microemboli (bacterial, marantic, eosinophilic endocarditis[12]), emboli (from arterial catheters), increased spiral artery fragility (end stage renal disease, hemodialysis, external radiation) platelet dysfunction (end stage renal disease, hemodialysis), direct vascular injury from larval migration (Trichinella spiralis—in which 60% of patients manifest splinter hemorrhages), and impairment of capillary repair mechanisms (anti-vascular endothelial growth factor and anti-platelet-derived growth factor drugs, and the tyrosine kinase inhibitors sunitinib and sorafenib.)[8] High altitudes may also precipitate vascular damage through multiple mechanisms including polycythemia, hypoxia, exertion, and cold induced-injury.[13] Onychomatricoma is a rare benign fibroepithelial tumor of the nail matrix itself that causes splinter hemorrhages 80% of the time.[14]

An accurate diagnosis is essential in selecting the appropriate therapy, which is directed at treating the underlying condition. Therapy may include local or systemic treatment for connective tissue disease and vasculitis or removing the offending drug.

Conclusions

The appearance of splinter hemorrhages requires a comprehensive evaluation and generates a broad differential diagnosis because etiologies can range from benign, self-limited disorders to serious acute or chronic disease, necessitating immediate treatment. A comprehensive history and physical examination as well as a knowledge of the differential diagnosis and mechanisms of injury are essential for accurately determining the diagnosis. Trauma is the most common etiology of splinter hemorrhages (20% of the cases) and causes include dermatoses, systemic disease, infectious diseases, chronic kidney disease, drug effects, and idiopathic causes. The underlying mechanism is disruption of the spiral arteries of the stratum granulosum causing linear hemorrhages under the nail plate. In the case presented, the etiology and mechanism of injury were elicited from history taking, as the patient initially reported the addition of pomegranates to his diet, and later revealed that he had been forcefully peeling and deseeding the pomegranates with his affected fingertips. This crucial discovery prevented further unnecessary testing and referrals and provided reassurance to both patient and physician. Within two months, the splinter hemorrhages had resolved.

Table 1[5,8,12]

Etiologies of Splinter Hemorrhages	
Vascular	Wegener's Granulomatosis, anitphospholipid syndrome, thrombangitis obliterans, anti-TNF-alfa-induced digital vasculitis, small and medium-vessel vasculitis, Raynaud's disease, digital artery obstruction, indwelling brachial catheter
Infectious	acute endocarditis, endarteritis, psittacosis, disseminated histoplasmosis, meningococcemia
Traumatic	elder age group (from walking aids), manual labor
Autoimmune	dermatoses (psoriasis, lichen planus) systemic juvenile idiopathic arthritis, marantic endocarditis
Metabolic	hemodialysis
Idiopathic	idiopathic splinter hemorrhage
Iatrogenic (Drugs)	tyrosine-kinase Inhibitors (sunitinib, sorafenib), nitrofurantoin, ganciclovir, tetracycline hydrochloride, terbinafine
Inflammatory	endomyocarditis
Neoplastic	onychomatricoma, paraneoplastic acral vascular syndrome, tuberous sclerosis complex
Hematologic	AL systemic amyloidosis, Langerhan's cell histiocytosis
Miscellaneous	high altitude, radiation exposure during the Chernobyl accident, healthy individual

Adapted from: Haber R, Khoury R, Kechichian E, Tomb R. Splinter hemorrhages of the nails: a systematic review of clinical features and associated conditions. Int J Dermatol 2016; 55: 1304–10.

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