

## Review Article

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Open Access, Volume 3

# Pretibial Haematoma in the Elderly: A Review of Management and Mortality

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### Abstract

**Background:** Pretibial injuries are common, with an estimated 0.4-0.7 per 1000 of the population affected per year, more commonly affecting elderly women. Pretibial haematomas complicate 42% of pretibial injuries admitted for hospital treatment. In District General Hospitals (DGH), they may be admitted under the care of Trauma and Orthopaedic Surgery or occasionally General Surgery. The mortality of patients treated in hospital for pretibial haematoma is not widely reported.

**Materials and methods:** 69 patients aged over 60 with low-energy pretibial injuries complicated by haematoma managed by trauma and orthopaedics were identified retrospectively from the departmental electronic database on Microsoft Access™ from January 2012 to December 2018, and their electronic notes were reviewed. A review of existing literature surrounding pretibial injuries was performed.

**Results:** Data showed an average inpatient stay of 15.4 days and an average of 4.4 outpatient clinic attendances following discharge. 8% of patients died during their inpatient stay. 14% of patients died within 30 days of presentation. 32% of patients were deceased with a year of discharge from hospital.

**Conclusion:** Pretibial haematomas in the elderly following minimal trauma are associated with lengthy inpatient stay, multiple outpatient attendances and high mortality. Extant literature advocates a multidisciplinary approach to managing these wounds with early surgical intervention when indicated and early mobilisation.

**Keywords:** Pretibial; Haematoma; Laceration; Elderly; Frailty; Mortality.

### Introduction

Pretibial injuries are a common cause for presentation to the emergency department, with an estimated 0.4-0.7 per 1000 of the population affected per year, more commonly affecting elderly women [1,2].

Low velocity soft tissue injuries to the pretibial region can cause significant wounds. The pretibial region is susceptible to injury: with ageing there is thinning of the skin and loss of dermal collagen. Retraction of the epidermal papillae contribute to flattening of the dermal-epidermal junction making it susceptible to shear forces. Overall, skin becomes more lax, less resilient and

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**Manuscript Information:** Received: Jun 20, 2023; Accepted: Jul 03, 2023; Published: Jul 10, 2023

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**Citation:** Thumri P, Thomas B, David F, Rohit S. Pretibial Haematoma in the Elderly: A Review of Management and Mortality. *J Surgery*. 2023; 3(2): 1112.

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less stretchable [3]. The blood supply to the pretibial skin is poor and this in turn affects healing [4]. Use of steroid medications further thins the skin and anticoagulant medication can pre-dispose to large haematoma formation from very minor trauma.

Most injuries are sustained inside the home or in the garden either as a result of a trip or fall or by bumping into or being struck by an object such as a piece of furniture, a car door, a step or pavement [1,5].

Severity of injury varies from small superficial lacerations to large degloving injuries [6]. The more significant injuries frequently require hospital admission for management with debridement, dressings and skin grafting in some cases. In tertiary centres these patients are normally managed under the care of plastic surgeons. In district general hospitals however, they will often come under the care of trauma and orthopaedics or occasionally general surgeons [7]. Due to the inherent underlying frailty and co-morbidities, these patients have a significant post-morbid mortality [8].

Pretibial haematomas complicate 42% of pretibial injuries admitted for hospital treatment [9]. Where there is threatened skin overlying, the haematoma should be evacuated as soon as possible [10,11]. Not only can haematoma cause a pressure effect on overlying tissue, but also causes compromise and death of adjacent tissue by the toxic effect of degradation products through complex pathways of cytokine activation, oxidative stress and activation of neutrophils causing small vessel occlusion [12].

Anecdotal observation within our department was that pretibial haematomas in the elderly appeared to have a high perimorbid mortality. We therefore conducted a retrospective review to look specifically at mortality associated with pretibial injuries complicated by haematomas.

## Materials and methods

Our departmental electronic database on Microsoft Access™ was reviewed retrospectively from January 2012 to December 2018 using the search terms 'haematoma' and 'hematoma'. 'Pretibial', 'lower limb', 'leg' and 'calf' haematomas were then selected. Haematomas associated with lacerations were included. Patients under the care of other specialties but who required orthopaedic input were included. Patients under the age of 60 were excluded. High energy mechanisms of injury were also excluded.

Electronic notes were reviewed to ascertain acute (<48h) or delayed (>48 h) presentation, use of anticoagulant/antiplatelet therapy at presentation, initial and subsequent management, length of inpatient stay, number of outpatient clinic attendances and mortality. Data was analysed using Microsoft Excel™.

## Results

A total of 69 patients were identified with ages ranging from 61 to 98 years. There were 14 (20.3%) males and 55 (79.7%) females. 32 (46.4%) patients presented acutely and 37 (53.6%) were classed as delayed presentation. 3 patients had associated minor injuries.

26 patients (37.7%) were warfarinised, 16 (23.1%) on antiplatelet medications (aspirin or clopidogrel), 7 (10.1%) on direct oral anticoagulants (DOAC), 2 (2.9%) on dual antiplatelet therapy, and 1(1.4%) on low molecular weight heparin. Only 17 patients

(24.6%) were on no anticoagulant or antiplatelet therapies.

49 (71%) of the patients underwent initial surgical management. 32 patients were managed with surgical debridement and simple dressings, 4 were treated with debridement and application of Vacuum-Assisted Closure (VAC) dressing, 4 patients were debrided at the bedside, 4 patients had debridement and local Full Thickness Skin Graft (FTSG), 3 were debrided and primarily closed, and 2 underwent debridement and Split Skin Graft (SSG). 15 of these patients required subsequent procedures. One patient underwent complex above knee amputation. One patient was referred to a tertiary centre for plastic surgery management. None of the patients who were initially treated with SSG or FTSG needed further surgery.

20 patients (29%) were managed conservatively initially with observation, elevation and/or dressings. 5 of these patients went on to have subsequent surgical management.

The average inpatient stay was 15.4 days with a minimum inpatient stay of 1day and a maximum stay of 67 days. Average number of outpatient clinic attendances was 4.4, with a maximum of 48 visits to clinic. Community follow up such as with practice nurses or tissue viability nurses was not recorded.

8% of patients died during their inpatient stay. Overall mortality 30 days after presentation was 14%. At one year after discharge from the acute hospital setting, the mortality rate was 32%.

## Discussion

Whilst there has been much discussion in the literature of management options in pretibial injury, the short and long-term mortality of patients treated in hospital is not widely reported.

Furthermore, to our knowledge, the mortality of patients with pretibial injury complicated by haematoma has not been published in the literature.

Many patients, in particular those taking anticoagulant medications, may present with large haematomas which can cause extensive necrosis to overlying skin and soft tissues. Our data showed that only a quarter of patients presenting with pretibial haematoma were not on anticoagulant or antiplatelet therapy. This reflects a degree of cardiovascular comorbidity in this patient group and may raise anaesthetic challenges. Thompson et al in their 2014 study report that unless the anticoagulation is reversed or the haematoma evacuated expeditiously, the viability of the overlying tissues can be lost, resulting in large defects which in turn require more complex surgery and can take longer to heal [13]. This presents a dilemma in management of these medically complex patients.

20 out of the 69 patients reviewed were initially managed conservatively. 5 of these patients went on to need one or more subsequent surgical procedures. The remainder continued with non-surgical treatment. Conservative management involves cleansing of the wound of debris and any haematoma with sterile wash such as normal saline, trimming of frayed or necrotic skin edges, and opposition of the skin edges without tension. Dressings are applied and regularly changed until the wound has healed. In 1977 Crawford & Gipson published results on 48 patients, all managed conservatively for pretibial lacerations. In all cases the wounds

healed [14]. McClelland et al. In a more recent study followed up 25 patients treated conservatively in the community. After 120 days 8 patients had failed to heal, but no information was given if they were then referred for surgical intervention [15].

Surgical intervention may be considered for patients where there is significant skin loss, a large or non-viable flap laceration and those with a large haematoma. The co-morbidities and frailty of these patients mean careful consideration must be given before surgery is carried out.

Of the 69 patients studied, 53% of patients presented to trauma and orthopaedic services over 48 hours after injury, and a little under half presented within 48 hours. A review of literature pertaining to timing of surgery suggests that this is dependent upon timing of presentation after injury, whether initial conservative treatment has been trialled, the patient condition, and delays. It is not unreasonable to trial conservative management in the very first few days after injury [16]. This allows demarcation of viable from non-viable tissue. Tuboku-Metzger et al. Showed in a retrospective single centre study of 73 patients that wounds treated surgically within 7 days from injury had an average healing time of 55 days. If delayed by 8 or more days, the average healing time was 110 days [17].

With regards to surgery, literature suggests that skin edges may be held in place with adhesive strips such as Steristrips, but where it is not possible to oppose the skin without tension, a gap should be left between the skin edges and be allowed to heal by secondary intention. Over tensioning the skin flap causes skin necrosis. Sutures should be avoided [18]. In 1985 Sutton & Pritty showed in a randomised trial of sutures compared to steristrips, that use of sutures doubled the incidence of flap necrosis in pretibial flap lacerations, and increased time to heal [19]. A novel technique using deep low-tension sutures through adhesive strips applied parallel to the wound edges showed good results in a single centre cohort study [20].

Where possible procedures should be performed under local or regional anaesthesia. Skin grafting after flap excision and wound debridement down to healthy bleeding tissue is a simple and effective technique for treating pretibial flap lacerations and can be performed under local anaesthetic [21]. The technique of "defatting" the skin flap in flap lacerations and laying it back on the defect as a skin graft has been described [22]. Whilst this avoids creation of a donor site for skin grafting, the 'take' of the severely compromised skin flap as graft is usually poor. In a prospective randomised trial of 25 patients who underwent primary excision and skin grafting or defatting of the flap, mean healing times of the pretibial wounds were 13.2 (primary grafting) and 40.7 (defatting the flap) days. 4 patients required further surgery from the defatting group. No comments were made on donor site morbidity [23]. In our study, of the 6 patients who were managed initially with either debridement and split skin grafting or defatting and full thickness skin grafting none required further surgical procedure.

A novel technique of exchange grafting, whereby the defatted flap from the pretibial wound is placed on the fresh thigh donor site in exchange for a fresh skin graft on the pretibial wound bed, has been described in a single case report [24]. Given the lack of evidence to support defatting or exchange graft techniques, Lo et al. Concluded that in cases of flap lacerations where the skin flap

is not viable it should be excised and grafted in the conventional manner [25]. The literature suggests mobilisation after surgical treatment of pretibial injury should be encouraged immediately as it does not affect graft take or wound healing, but reduces the risks associated with lying recumbent in a hospital bed [2,26].

Whilst there has been much discussion in the literature of management options in pretibial injury, the short and long-term mortality of patients treated in hospital is not widely reported.

Rees et al. In a retrospective case notes review of 109 patients showed an overall 6-month mortality of 11% following pretibial laceration [8]. Furthermore, they demonstrated that a longer time to surgery of 5 days rather than 2 was significantly associated with mortality. It is difficult to know if this delay is causally related rather than the delays reflecting a more frail, medically complex, unwell patient at presentation, who requires further investigations and optimisation. Glass & Jain in their review of 73 patients showed a 3-month mortality of 10% [9]. Cahill et al. In their retrospective review of a cohort of 58 patients, 53 underwent surgery (91%) and at 31 days post operatively had a 15% mortality. In a separate cohort in the same study, managed with a truly multidisciplinary approach; including outreach nurse assessment, weekly MDT review of all referrals, careful discharge planning pre-operatively, the mortality was significantly reduced to a 4.3% (2/46 patients) 31-day post-operative mortality [27].

Patients who sustain pretibial injuries are predominantly frail, elderly females with medical co-morbidities [16], as reflected in our data (55 females: 14 males). This is a very similar demographic as patients who sustain fractures of the proximal femur. Management of hip fractures has changed dramatically over the last decade, with the introduction of the National Hip Fracture Database (NHFD) and combined Orthopaedic and Geriatric specialist care [28,29]. 30-day mortality from hip fractures fell from 10.9% to 8.9% from 2007 to 2011 [30], and is currently 6.1% [31]. This marked improvement has come about by understanding the importance of a true multidisciplinary approach combined with early surgery and early mobility. Our study showed a 30-day post-presentation mortality of 14% which is similar to Cahill et al's original cohort, and more than double the national 30-day mortality for hip fractures.

At 1-year post discharge from acute hospital bed, our data showed a mortality of 32%, which is greater than reported mortality of hip fractures (22%) [32]. But similar to mortality of odontoid peg fractures (34%) [33]. Reflecting the frailty of this patient group.

Our study is limited by its retrospective nature, and small sample size. Although we recorded the use of anticoagulant or anti-platelet therapy and their indications, we did not collect any data pertaining to other medical comorbidities, functional status or ASA grade. Our study may also be limited by advances in technology following the period studied, such as the common availability of VAC therapy.

## Conclusion

Pretibial injuries complicated by haematoma occur more frequently in elderly female patients. Presentation may commonly be complicated by the concurrent use of anticoagulant or anti-platelet therapy. These injuries are associated with lengthy inpatient stay, multiple outpatient attendances and high mortality.

The available literature advocates a multidisciplinary approach to managing these wounds with early surgical intervention when indicated and early mobilisation. This is the first reported case related to pre-tibial haematoma mortality on orthopaedic wards.

**Abbreviations:** DGH: District General Hospital; DOAC: Direct Oral Anticoagulant; VAC: Vacuum Assisted Closure; FTSG: Full Thickness Skin Graft; SSG: Split Skin Graft; NHFD: National Hip Fracture Database.

### Declarations

The authors declare no conflicts of interest.

No funding was received by any party in writing this paper.

### References

1. Laing R, Tan S, Mcdouall J, Wright C, Niven B, Wilson C. Pretibial injury in patients aged 50 years and over, NZ Med J. 2002; 115: 1-11.
2. Budny PG, Lavelle J, Regan PJ, Roberts AHN. Pretibial injuries in the elderly: A prospective trial of early mobilisation versus bed rest following surgical treatment. Br J Plast Surg. 1993; 46: 594-598.
3. Lavker RM, Zheng P, Dong G. Aged Skin: A Study by Light, Transmission Electron, and Scanning Electron Microscopy. J. Invest. Dermatol. 1987; 88: 44s-51s.
4. Haertsch PA. The blood supply to the skin of the leg: A post-mortem investigation. Br J Plast Surg. 1981; 34: 470-477.
5. Tandon SN, Sutherland AB. Pretibial Lacerations. Br J Plast Surg. 1973; 26: 172-175.
6. Dunkin CSJ, Elfleet D, Ling C, Brown TP La H. A step-by-step guide to classifying and managing pretibial injuries. J Wound Care. 2003; 12: 109-111.
7. Davis A, Chester D, Allison K, Davison P. A survey of how a region's A&E units manage pretibial lacerations. J Wound Care. 2004; 13: 5-7.
8. Rees LS, Chapman T, Yarrow J, Wharton S. Long term outcomes following pretibial injury: Mortality and effects on social care. Injury. 2008; 39: 781-785.
9. Glass GE, Jain A. Pretibial lacerations: Experience from a lower limb trauma centre and systematic review. J Plast Reconstr Aesthet Surg. 2014; 67: 1694-1702.
10. Barnard AR, Allison K. The classification and principles of management of wounds in trauma. Trauma. 2009; 11: 163-176.
11. Karthikeyan GS, Vadodaria S, Stanley PRW. Simple and safe treatment of pretibial haematoma in elderly patients. Emerg Med J. 2004; 21: 69-70.
12. Glass GE, Nanchahal J. Why haematomas cause flap failure: An evidence-based paradigm. J Plast Reconstr Aesthet Surg. 2012; 65: 903-910.
13. Thomson WL, Pujol-Nicolas A, Tahir A, Siddiqui H. A kick in the shins: The financial impact of uncontrolled warfarin use in pretibial haematomas. Injury. 2014; 45: 250-252.
14. Crawford BS, Gipson M. The conservative management of pretibial lacerations in elderly patients. Br J Plast Surg. 1977; 30: 174-176.
15. McClelland HM, Stephenson J, Ousey KJ, Gillibrand WP, Underwood PH. Wound healing in pre-tibial injuries-an observation study. Int Wound J. 2011; 9: 303-310.
16. Lamyman MJ, Griffiths D, Davison JA. Delays to the definitive surgical management of pretibial lacerations in the elderly. J Wound Care. 2006; 15: 422-424.
17. Tuboku-Metzger V, Chambers J, Osmani O, Nightingale P, Eltigani T, et al. Early debridement reduces time to healing in elderly patients with pretibial injury. J Plast Reconstr Aesthet Surg. 2013; 12; 742-744.
18. Jones BM, Sanders R. Pretibial injuries: A common pitfall. Br Med J. 1983; 286: 502.
19. Sutton R, Pritty P. Use of sutures or adhesive tapes for primary closure of pretibial lacerations. Br Med J, (Clinical research ed).1985; 290: 1627.
20. Silk J. A new approach to the management of pretibial lacerations. Injury. 2001; 32: 373-376.
21. Shankar S, Khoo CTK. Lower limb skin loss: Simple outpatient management with meshed skin grafts with immediate mobilization. Arch Emerg Med. 1987; 4: 187-192.
22. Grant DA. Treating pre-tibial lacerations in elderly patients. Br J Gen Pract. 1993; 174.
23. Haiart DC, Paul AB, Chalmers R, Griffiths JMT. Pretibial lacerations: A comparison of primary excision and grafting with "defatting" the flap. Br J Plast Surg. 1990; 43: 312-314.
24. Khan U, Ho K, Deva A. Exchanging split-skin grafts to reduce donor morbidity in limited pretibial degloving injuries. Plast Reconstr Surg. 2004; 113: 1523-1524.
25. Lo S, Hallam MJ, Smith S, Cubison T. The tertiary management of pretibial lacerations. J Plast Reconstr Aesthet Surg. 2012; 64: 1143-1150.
26. Luscombe JC. Mobilisation after skin grafting of pretibial lacerations. Br J Plast Surg. 2001; 54; 646-655.
27. Cahill KC, Gilleard O, Weir A, Cubison TCS. The epidemiology and mortality of pretibial lacerations. J Plast Reconstr Aesthet Surg. 2015; 68: 724-728.
28. Middleton M. Orthogeriatrics and hip fracture care in the UK: Factors driving change to more integrated models of care. Geriatrics (Switzerland). 2018; 3: 1-6.
29. Leung F, Blauth M, Bavonratanavech S. Surgery for fragility hip fracture- streamlining the process [Editorial]. Osteoporos Int. 2010; 21: 519-521.
30. Neuburger J, Currie C, Wakeman R, Tsang C, Plant F, et al. The Impact of a National Clinician-led Audit Initiative on Care and Mortality after Hip Fracture in England An External Evaluation using Time Trends in Non-audit Data. Med Care. 2015; 53; 686-691.
31. Royal College of Physicians. National Hip Fracture Database Annual Report 2019. London: RCP. 2019.
32. Downey C, Kelly M, Quinlan JF. Changing trends in the mortality rate at 1-year post hip fracture-a systematic review. World J Orthop. 2019; 10: 166-175.
33. Shafafy R, Valsamis EM, Luck J, Dimock R, Rampersad S, Kieffer W, et al. Predictors of mortality in the elderly patient with a fracture of the odontoid process. Can we use non-spinal scoring systems? Bone Joint J. 2019; 101: 253-259.