

# FLAMINAL® IN THE MANAGEMENT OF A GUNSHOT WOUND IN A 12 YEAR-OLD BOY

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## Summary

This poster describes the management of an accidental gunshot wound in a 12 year-old boy through the use of an antimicrobial enzyme alginogel (Flaminal®) to achieve wound debridement, restore bacterial balance and ultimately achieve healing.

## Introduction

Gunshot injuries can cause extended soft tissue damage and traumatic contamination leading to infection. The injury sustained results from the release of energy by the bullet as it passes through the tissue and is determined by a combination of the speed, shape, size and stability of the bullet.<sup>1</sup> Initial observation of both the entry and exit wounds may not accurately reflect the full extent of damage. The resulting cavity is created by negative pressure and is associated with both the entry and exit points of the bullet passing through the tissue. Debris, air, clothing and bacteria are effectively sucked in thereby contaminating the wound.

## The wound

A 12 year-old boy clay pigeon shooting at a gun club with his father, rested the barrel of a shot gun onto his left foot; the gun accidentally discharged. He was subsequently admitted to the regional paediatric plastic surgery centre with a 1cm entry wound to the first web space of his left foot and a 3-4cm plantar exit wound with visible shrapnel to the wound margin (Figure 1). Whilst there was no neurovascular deficit, X-Ray revealed a fracture to the first proximal phalanx of the left foot with multiple metal fragments to the surrounding tissue. A total of 18 foreign bodies were removed when the wound was debrided in theatre.



Figure 1.

## 2 days post-injury

With high-velocity wounds, the skin and subcutaneous tissue have traditionally required wide excision to fully expose the depths of the wound. This was undertaken 48 hours post-injury, as the first web space extending to the plantar aspect was heavily contaminated. The exposed and damaged (multiple bone fragments found) metatarsal phalangeal joint (MTPJ) and fragments were stabilized by the insertion of a Kirschner wire (also called a K wire, a thin rigid wire). The collateral ligament that helps to stabilise the MTPJ had also been completely destroyed in the accident. It was possible at this juncture for primary closure of the wound on the dorsum of the foot, but primary closure was delayed on the plantar aspect (Figure 2).

The techniques of closure for high-velocity and contaminated low-velocity wounds have developed from military experience and are documented from 1794. Further debridement and washout of the deficit was performed 48 hours after the initial surgery exposing a large cavity to the web space that was managed for two weeks with topical negative pressure (TNP).



Figure 2.

## 16 days post-injury

On removal of sutures from the dorsum of the foot a deep sinus (2.5cm x 0.5cm) remained from the plantar aspect through the first web space. TNP was discontinued as the wound was sloughy and a decision made to utilize Flaminal® Forte to debride the wound and manage the wound bioburden (Figure 3).



Figure 3.

## Wound management with Flaminal® Forte

After 6 days of treatment with Flaminal® Forte there was evidence of granulation tissue at the wound margins but also some erythema localised to the pin site. Results from microbiology of a wound swab confirmed that the area was colonised with skin flora only, within a further 48 hours the erythema had disappeared and the wound was clean with the sinus decreasing to 1cm x 0.5cm. Healing was achieved after a further 6 days of treatment with Flaminal® (Figure 4).

## Discussion

The potential risk of infection including osteomyelitis was evidenced by the vigilance of the team with two visits to theatre for debridement and washout. Selecting a topical treatment with a proven broad-spectrum antibacterial activity including multi-resistant strains



Figure 4.

of bacteria was important. Flaminal® (Flen Pharma) is an antimicrobial enzyme alginogel, which combines the benefits of hydrogels and alginates with a patented antimicrobial enzymatic complex (glucose oxidase combined with lactoperoxidase). Enzyme alginogels may be indicated for long-term use in exuding wounds irrespective of the wound bacterial bioburden, as they are known to only target the cell walls of bacteria and not those of healthy cells such as keratinocytes.<sup>2</sup>

## Conclusion

In wounds with sinus tracks there is a risk that these can fail to heal and become chronic problems, particularly if there is a risk of incomplete cleansing following a penetrating trauma such as a gunshot. Utilising a product such as Flaminal® that could be safely inserted into the sinus assisted the clinicians in protecting against microbial colonisation and combating infection, key factors in the management of this accidental gunshot wound, whilst promoting autolytic debridement and absorbing exudate.

## References

1. Maiden N. Ballistics reviews: mechanisms of bullet wound trauma. *Forensic Sci Med Pathol* 2009; 5(3):204-209
2. White R. Flaminal®: a novel approach to wound bioburden control. *Wounds UK* 2006; 2(3):64-69