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HISTORY
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Liston's splint – A forgotten first aid technique

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ABSTRACT

The effective immobilisation of fractures has always been an important aspect of prehospital care. A fractured femur is a serious injury which can result in significant pain, haemorrhage, and tissue damage, but these complications can all be minimised by splinting. This can best be achieved with a traction splint, which is standard equipment in all modern ambulance services. However, in rural and remote Australia, or in the developing world, trained bystanders need a method for handling a fractured femur while awaiting professional help. Paramedics may need an alternative to the traction splint, in situations of mass casualty disasters. A method which is suited to these scenarios was first described by Robert Liston in 1846, and was subsequently adapted for first aid use. Liston was a Scottish born surgeon, whose work in the pre-anaesthetic era is regarded as remarkable. Liston's splint formed part of the armamentarium of first aid from 1878 to 1982, and its role in contemporary prehospital care should be reconsidered.

Keywords: *emergency medical services; femoral fractures; first aid; history of medicine; Robert Liston; splints.*

Introduction

This paper provides an overview of the life and work of Robert Liston (1794-1847), and examines the method of splinting femoral fractures which he devised. This splint was subsequently adapted for first aid and military use in the late 1800's, but has been lost from today's first aid doctrine. While Liston's splint has largely been superseded by more modern equipment, it still has a role in some situations such as remote areas and disasters. Its place in contemporary prehospital care should be reconsidered.

Figure 1: Robert Liston (1794-1847) *Permission of the Science and Society Picture Library*



Robert Liston (Figure 1) was born in 1794, in the parish of Ecclesmachian, Scotland. His father was the minister there, and provided most of his early education. He entered the University of Edinburgh in 1808, and two years later commenced medical studies.

Liston was appointed to the Royal Infirmary in 1814, and then worked in London from 1816, where he was admitted as a Member of the Royal College of Surgeons that same year. A year later, he gained Fellowship of the Royal College of Surgeons of Edinburgh.¹

Liston worked and taught between Edinburgh and London. Although undoubtedly the best surgeon of his day, he was arrogant and had a furious temper, which at times caused conflict with his colleagues. When he was overlooked for the Chair of Surgery at the Royal Infirmary, he accepted the post at the University College Hospital, London.¹

Liston was indeed a capable generalist surgeon, especially considering that he worked in the pre-anaesthetic era. At that time, speed was essential in an operation, and Liston could amputate a leg in under thirty seconds! However, he also recognised the importance of dexterity and a sound knowledge of anatomy, which enabled him to operate on patients who were considered inoperable by other surgeons. As a Professor of Surgery, he wrote several influential textbooks, and published many papers.^{1,2}

Liston died in 1847 at the age of 53, as a result of an aneurysm which ruptured into his trachea. Only one year before his death, he performed the first operation in Europe under ether anaesthesia – an above knee amputation.¹

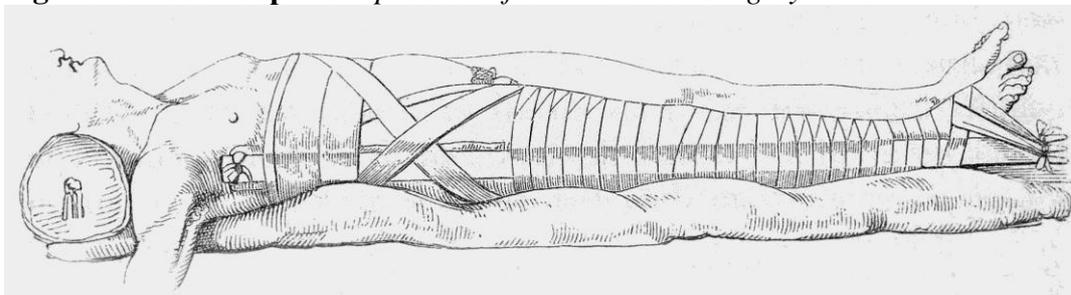
Liston's splint

Although various forms of splinting have been known since antiquity, Liston devised an innovative approach to immobilising fractures of the femur. Liston's method attempted to overcome the problem of limb shortening, caused by overriding of the bone fragments. The technique was included in his textbook *Practical Surgery*, and is described as follows:

“The apparatus consists of a plain...board, of a hand's breadth for an adult...to extend from opposite the nipple, to...four inches beyond the sole of the foot. It is perforated at the other end by two large holes, and provided with two notches at the other...The perineal band is now placed under the patient...The splint is then laid along the outside of the limb, and...the roller [bandage] is carried repeatedly through the notches in the end of the splint, as it is crossed over the dorsum of the foot, and ultimately turned round the limb to near the groin...thus the apparatus is prevented from slipping upwards. The ends of the perineal band are passed through the perforations, drawn with moderate firmness, and...tied; a few turns of a broad bandage round the pelvis and chest complete the proceeding. The perineal band, by which the splint, and with it the limb, is pushed downwards, is attended to from day to day, and tightened as it becomes relaxed.”³

The splint is shown in Figure 2. At that time, such a splint would have been the definitive medical treatment, and the patient would have been nursed in their own home with the splint *insitu* for many weeks.

Figure 2: Liston's splint Reproduced from *Practical Surgery 1846*³



Use by St John Ambulance

The inaugural St John first aid textbook was written by Surgeon-Major Peter Shepherd in 1878.⁴ In this manual, Shepherd included a simplified version of Liston's splint, suitable for application by trained bystanders.⁵ Although this did not include the perineal band for

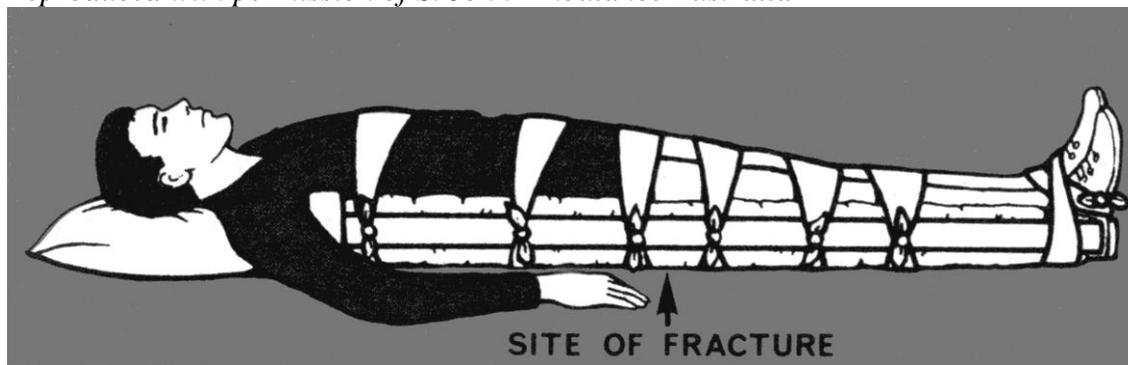
exerting traction, the first aider was instructed to manually extend the limb before applying the splint. Thus it would have provided satisfactory immobilisation, and maintained a degree of traction, while the patient was moved on a makeshift stretcher or horse-drawn vehicle.

The importance of effective immobilisation of femoral fractures was highlighted by the initially high mortality rate from this injury during World War I. While Thomas' traction splint was the preferred treatment, the large numbers of casualties often meant that equipment ran short, and the "Long Liston" was certainly used.⁶

Liston's splint remained a part of the armamentarium of first aid for 100 years, and Figure 3 shows how it appeared in the 1969 St John first aid manual.⁷ However, in the early 1980's, Liston's splint was unfortunately deleted from the first aid curriculum altogether. Having appeared in every edition of the St John manual since 1878, it was omitted in 1982.⁸

Figure 3: Liston's splint modified for first aid use

Reproduced with permission of St John Ambulance Australia



This omission probably occurred for two reasons. Firstly, there has been an increase in the range and availability of traction splints which are now universally carried by Australian ambulance services. Secondly, there has been a major shift in public first aid courses away from injury management, towards resuscitation and medical emergencies⁹. Even in the advanced first aid courses available today, very little instruction is given in methods of bandaging and splinting.⁹ The pendulum has possibly swung too far in this regard, and it could be argued that advanced level first aiders are deficient in the skills needed to handle fractures efficiently, especially outside urban centres.

Liston's splint in contemporary practice

Within the urban areas of a developed nation like Australia, professional paramedics can respond quickly to trauma, and use a modern traction splint to immobilise a fractured femur. In this context, it would not be appropriate for Liston's splint to be utilised either by paramedics, or bystander first aiders. However, it is not difficult to conceive other scenarios, in which Liston's splint could prove to be an invaluable tool.

In the remote areas of outback Australia, there can be a delay of many hours or even days before medical help can reach a patient.^{10,11} Road ambulances may respond over distances of several hundred kilometres, while the Royal Flying Doctor Service uses fixed wing aircraft to travel distances up to 1000 km.¹¹ The first aiders managing a fractured femur in this isolated context need to have advanced splinting skills in order to effectively combat pain and shock. This is especially important if the patient has to be carried on an improvised stretcher, or in a makeshift vehicle. It is unfortunate that even a specialised textbook on remote area first aid contains no specific information on splinting fractures.¹² Issues of remoteness, and delayed access to medical care are also encountered throughout the developing world.

Disaster situations may result in hundreds or even thousands of casualties. Supplies of medical equipment (such as traction splints) may be simply insufficient in quantity. In this situation, paramedics will need to resort to improvised methods to immobilise fractures.¹³ A similar scenario could be faced in a military combat zone, where Liston's splint could prove invaluable.

Conclusion

A femoral fracture is a serious injury, and is associated with significant morbidity. Liston's splint is an effective means of stabilising this injury, and formed part of the armamentarium of first aid practice from 1878 to 1982. The availability of modern traction splints has made Liston's splint redundant within urban areas. However, Liston's splint still has a valid role within rural and remote areas, the third world, mass casualty incidents, and military conflict scenarios. This valuable splinting technique should receive increased attention within advanced first aid courses, and be reintroduced into first aid textbooks.

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