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Original Article

Single incision lateral release for hallux valgus using a cervical biopsy blade: A cadaveric study

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ABSTRACT

The role of lateral release is widely accepted and regarded as a key step in the management of hallux valgus. There remains however debate in the literature in regards to which structures should be divided and the method of approach. As such, a technique of lateral release using a curved blade placed inferior to the metatarsal head to divide the lateral metatarsosesamoid suspensory ligament and incise the lateral joint capsule has been developed. This technique was performed on fourteen fresh frozen cadaveric specimens which were then dissected. In all cases the lateral metatarsosesamoid suspensory ligament was divided and the lateral capsule incised to the joint line. One case of iatrogenic injury to the oblique head of adductor hallucis tendon was noted. No cases of neurovascular injury were noted. The authors conclude that this method of lateral release to be safe and reproducible in a cadaveric model in achieving lateral release for the management of hallux valgus.

1. Introduction

Hallux valgus is a condition of both bony deformity and dynamic soft tissue imbalance [1,2]. More than 140 surgical procedures have been described in the treatment of hallux valgus (HV) [3], the aim being to relieve symptoms through correction of the deformity. The most common of these procedures include scarf or chevron osteotomy of the 1st metatarsal in combination with Akin osteotomy of the proximal phalanx of the first ray. In mild to moderate deformities an additional soft tissue release procedure may not be required [4] but a lateral soft tissue release is largely accepted, and regarded, as a key step in the surgical management of more severe hallux valgus deformities without which "the correction may be inadequate" [5].

Debate remains within the literature as to the structures which should be divided to achieve an adequate soft tissue release, particularly whether to divide the conjoint tendon (adductor hallucis and flexor hallucis brevis), lateral sesamoid suspensory ligament, phalangeal band insertion and transverse metatarsal ligament [4,6,15,7–14]. Despite this, the majority of authors advocate release of the lateral sesamoid suspensory ligament, lateral collateral ligament and lateral capsulotomy.

Traditionally, the lateral release has been performed through a dorsal webspace incision. However, this has raised concerns due additional incision, wound infection, decreased range of movement at the Metatarsal Phalangeal Joint (MTPJ), digital neuritis, poor cosmesis and risk of avascular necrosis (AVN) of the metatarsal head [4,9,10,13]. Alternative procedures including trans-articular, trans-osteotomy, medial single incision, dorsal and plantar sub-periosteal elevation and minimally invasive techniques have been described in an effort to minimise these complications [9,13,16]. However, alternative techniques may require additional soft tissue stripping, retraction and additional equipment and expertise.

The aim of this cadaveric study was to evaluate the technique of lateral release using a curved cervical biopsy blade placed inferior to the metatarsal shaft, head and neck to achieve division of the lateral metatarosesamoid suspensory ligament.

2. Methods

This study had ethical approval under the University of Keele Human Tissue Act licence. In line with this, informed consent had been previously obtained for experimentation with human subjects and photography of the cadaveric specimens provided.

The procedure was conducted on fourteen fresh frozen cadaveric below knee specimens. This is comparable to the previous literature using a cadaveric model in which 10–30 specimens were used [7,12,17,18]. Of the fourteen specimens four clinically exhibited hallux valgus deformity. There were three paired specimens. The mean donor

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Fig. 1. Incision in line with medial border of first metatarsal shaft and proximal phalanx.

age was 80.1 years (range 68–89 years) with a male: female ratio of 10:4.

Specimens were stored at −20 °C. Thawing was conducted at 5 °C for a period of 96 h. Lateral release was performed in all specimens by the same surgeon using the technique described below. The primary outcome was division of the lateral metatarsosesamoid suspensory ligament and preservation of the neurovascular bundle.

The specimens were then dissected independently by a second investigator. Extensile dorsal and plantar 1st web space incisions were made and with loupe magnification the integrity of the dorsal and plantar neurovascular bundle, lateral suspensory ligament, lateral collateral ligament, lateral capsule, adductor insertion and deep transverse metatarsal ligament were assessed and recorded.

2.1. Surgical technique

A medial incision was made inline with the longitudinal axis of the proximal phalanx and first metatarsal shaft of the hallux (Fig. 1).

The incision was advanced to the capsule overlying the first MTPJ and developed in the dorsal and plantar planes. A longitudinal capsulotomy was performed in line with the incision (Fig. 2). The soft tissues were dissected from the metatarsal neck and shaft in preparation for the required osteotomy. Care was taken to preserve the plantar soft tissue attachments proximal to the metatarsal head in order to reduce the risk of avascular necrosis (Fig. 3).

The sesamoid bones were visualised (Fig. 4). The curved end of a McDonald elevator was placed over the dorsal surface of the lateral sesamoid (Fig. 5).

Fig. 2. Longitudinal medial capsulotomy.

Fig. 3. Plantar soft tissues attachments to metatarsal neck are preserved.

Fig. 4. Lateral and medial sesamoids are identified.

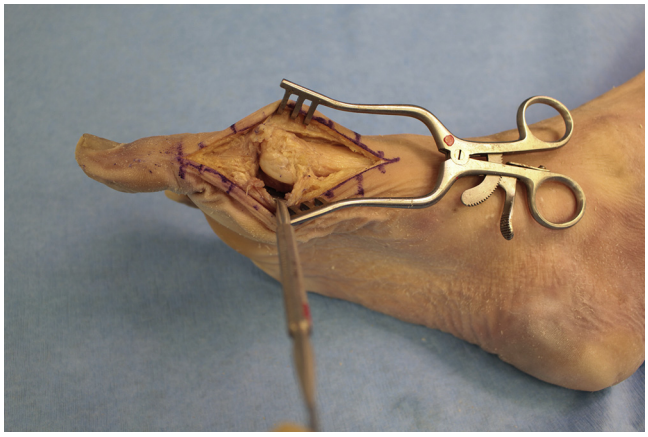

Fig. 5. McDonald dissector is placed dorsal to the sesamoids.

A cervical biopsy blade (Swann Morton Cervical Biopsy Blade 2001) (Fig. 6) was inserted over the McDonald elevator with its curved blade passed in a dorso-lateral direction around the metatarsal (Fig. 7). The blade was advanced proximally and distally using tactile feedback to divide the lateral suspensory ligament (Fig. 8).

3. Results

Four of the specimens utilised to examine this technique clinically exhibited hallux valgus deformity.

All fourteen dissected specimens demonstrated division of the