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# Chronic complete proximal hamstring injury: The double-window approach for bony avulsions

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ABSTRACT

Proximal hamstring injury represents a spectrum of trauma to either the bone or the soft tissues. Injuries can be complete or incomplete. Complete injuries usually require surgical treatment.We discuss the operative management of eight consecutive cases of chronic complete proximal hamstring injuries (injury to surgery >2.5 months). Of the eight patients, three patients had soft tissue avulsions, which were reattached with anchors via a longitudinal buttock crease incision. Five patients had bony avulsions requiring open reduction and internal fixation. In three of these, the retraction of the fragment into the thigh was so great that it was not easily retrievable and fixable through a conventional approach. On the basis of a cadaveric study, a double-window surgical approach was developed to enable us to treat these avulsions with extreme retraction. This approach can be used for other less severe injuries.


## Introduction

There is a spectrum of proximal hamstring injury in both adults and children. Most proximal injuries in adults occur at the musculo-tendinous junction,[4,5] which can be managed non-operatively with rest and rehabilitation as the lesion usually lies within the muscle bodies in the mid-thigh.[2]

Complete proximal injuries are best treated by surgical repair.[6,10,11] Proximal hamstring avulsions can involve a fracture that can enter the acetabulum. These require open reduction and internal fixation, both for anatomical reduction of the articular surface, as well as to promote bony union. These bony injuries can be reduced and fixed adequately by a Kocher–Langenbeck-type approach.[7]

We describe our operative series of eight patients, who presented to the orthopaedic unit over a 12-year period. All of them all had chronic injuries (injury to surgery >2.5 months). The soft-tissue hamstring injuries were exposed by lifting up the inferior part of gluteus maximus and were reduced and fixed using suture anchors. Any injuries requiring open reduction were treated through a conventional Kocher–Langenbeck approach; however, in extreme cases of retraction, it was not possible to carry out the surgery through this approach. In anticipation of difficulties in retrieving and fixing the fragments, a cadaveric study was used to develop the double-window approach.

## Surgical considerations

There are three phases of the surgical procedure for the re-attachment of delayed proximal hamstring injuries.

(1) *Identification of the lesion*. In complete soft tissue avulsions, the tendon mass is identified usually in a fluid-filled cavity below the inferior edge of gluteus maximus. In all except the most muscular individuals, it is possible to do this by upward retraction of the buttocks mass. In fresh bony avulsions without excessive retraction, this is best done through the Kocher–Langenbeck approach. In chronic bony avulsions with severe retraction, the proximal thigh must be explored through a vertical incision below the inferior edge of the gluteus maximus. The posterior cutaneous nerve of the thigh also requires identification and retraction.
(2) *Distal dissection*. The fragment or soft tissue mass must be mobilised and freed up by dissecting distally. The patient is in the prone position and the knee if flexed to aid mobilisation. The sciatic nerve is identified, dissected free and mobilised.
(3) *Reduction and fixation*. With freshly minimally displaced avulsions, it is usually possible to identify, mobilise, reduce and fix the injury through either the buttock crease with soft tissue avulsions or via a Kocher–Langenbeck incision with bony injuries. However, with those that present late, identification,

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**Table 1**
Eight patients presented with chronic proximal hamstring injury.

| Gender | Age in years | Injury to surgery | Mechanism | Injury | Surgery | Fixation | Patient outcome |
|---|---|---|---|---|---|---|---|
| m | 41 | 1 yr | Assault | Inferior acetabular fragment | Kocher–Langenbeck | Plate | Full activity |
| m | 11 | 2.5 months | Ski jump | Bony apophysis | Kocher–Langenbeck | Plate | Full activity |
| m | 13 | 4.5 months | High jump | Bony apophysis | New window | Plate | Full activity |
| m | 22 | 10 yrs | Rubber ring | Bony apophysis | New window | Plate | Full activity |
| m | 15 | 6 months | Sprinting | Bony apophysis | New window | Plate | Full activity |
| m | 26 | 1 yr | Rugby tackle | Soft tissue avulsion | Longitudinal incision | Mitek anchors | Full activity |
| m | 33 | 14 yrs | Martial arts | Soft tissue avulsion | Longitudinal incision | Mitek anchors | Full activity |
| m | 34 | 5 months | Judo | Soft tissue avulsion | Longitudinal incision | Mitek anchors | Full activity |

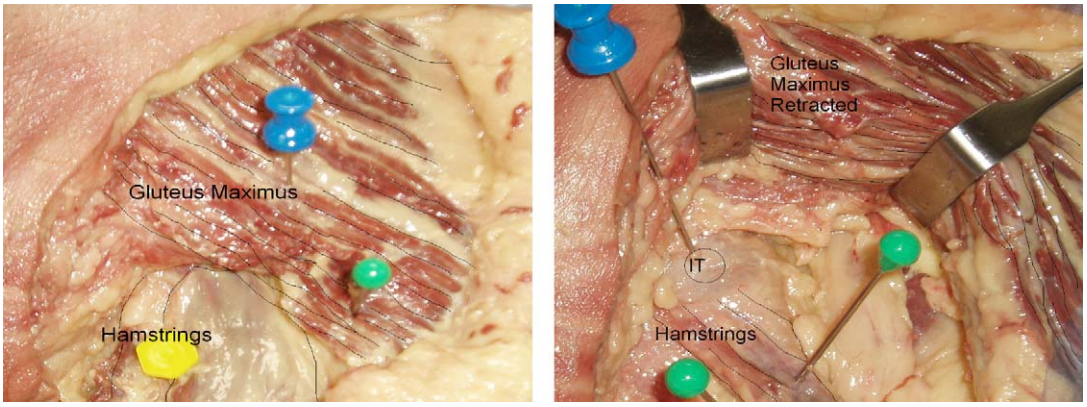


**Fig. 1.** The buttock crease incision.

mobilisation reduction and fixation through one incision are almost impossible through a single approach. Through a vertical incision, it is possible to carry out identification and mobilisation but adequate reduction and fixation is not possible by lifting up the inferior border of the gluteus maximus. The proximal half of the Kocher–Langenbeck incision (Kocher) in a space between the upper two-thirds and distal one-third of the gluteus maximus is thus used. Through this approach, it is possible to feed the fragment under the bulk of the gluteus maximus muscle, and identify exactly where the fragment is to be fixed. Fixation is much safer as the drill anchors are pointed horizontally and penetration of the acetabulum will be avoided. Care always has to be taken, especially with bony avulsions, not to enter the hip joint with hardware.

## Patient details

Operative treatment was performed for eight consecutive cases with chronic complete proximal hamstring injuries. Of the eight patients, three patients had soft tissue avulsions, which were reattached with anchors via a longitudinal buttock crease incision. Five patients had bony avulsions requiring open reduction and internal fixation. In three of these, the retraction of the fragment

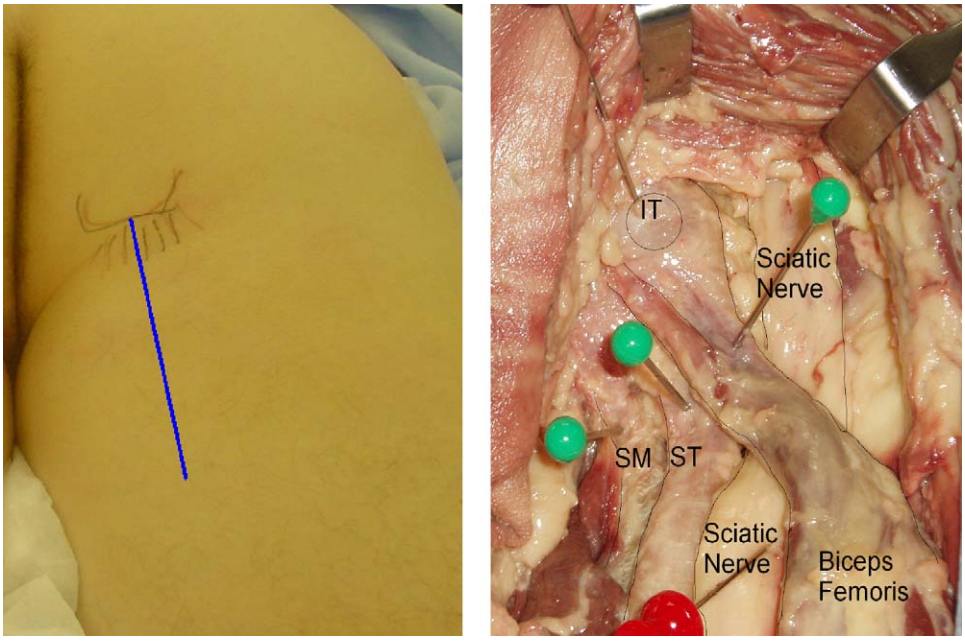


**Fig. 2.** Exposure with the longitudinal incision.