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Review Article

Systematic Review and Audit of our Series of Intra Capsular Fracture Fixation Using a New Implant; Targon Fn Plate System with Tips Learned from our Experience

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Abstract

The two most commonly used implants for the fixation of minimally displaced intra-capsular fractures of the neck of the femur are the multiple parallel screw method and the sliding hip screw method. The sliding screw allowed for collapse of the bone at the fracture site and the multiple screw technique allowed for rotational stability. These two implants have individual mechanical properties which have been combined into the design of the TARGON plate.

Keywords: *Intra Capsular Fracture; TARGON; Femur; Neck*

Introduction

The main objective of our study was to analyse the TARGON plate system used in three district general hospital to fix intra-capsular [1] fractures with regard to operating time, metal work cut out, failure of fixation and avascular necrosis of the head of the femur.

The study was performed over a period of one year from 2012 to 2013 in three different district general hospitals in the UK. The plate system was only used to fix AO 31B1 and 31B2 fractures. All patients with the above fractures were included in the study. Displaced intra-capsular fractures were not included in the study as the TARGON plate is not recommended for these fractures and further, fixation is not the suitable treatment for displaced intra-capsular fractures. This was a retrospective study and involved three surgeons from different parts of the country who used this system.

Methods

Patients who were deemed suitable to undergo fixation of their AO 31B1 and 31B2 fractures were operated following anaesthetic optimization within 36 hours of admission. The procedure was performed under spinal anaesthesia or general anaesthesia. The operative technique involved positioning the patient on the traction table and either fixing the fracture *in situ* or minimal manipulation to reduce the fracture and fixing. The approach was a direct lateral approach with an average skin incision length of 5 cm. The fascia lata was divided in line with the skin incision. The vastus lateralis was divided close to the lateral intermuscular septum and elevated. The perforator vessels of the profunda femoris artery were identified and diathermised. The proximal femur shaft and the flare of the trochanter is thus adequately exposed as for a standard dynamic hip screw fixation. The TARGON system jigs are aligned along the shaft of the femur and targeted on the central axis of the neck and the head with the radio graphical marker. The fixation is performed using the jigs in the system [2]. This allows the positioning of three telescopic screws into the head of the femur parallel to each other allowing linear collapse and preventing rotational instability. The plate is then attached to the shaft as a DHS plate would be. The vastus lateralis muscle is allowed to

fall over the plate providing cover for the metal work. The muscle is tacked to the lateral inter muscular septum with interrupted absorbable sutures. The fascia lata is then closed with thick absorbable sutures and the subcutaneous fat is approximated with 2/0 absorbable sutures. The skin is closed with a subcuticular suture and tissue glue. Dressings are applied and the patient is detached from the traction table.

By the next post-operative day patients are mobilized. Full weight bearing is encouraged.

The patients were followed up at 06 weeks in fracture clinic, 03 months, 06 months and one year with radiographs done in AP and lateral planes. Long term follow-up is on-going.

Results

A total of 46 patients were identified who had the above fractures and were fixed with the TARGON plating system. Out of the 46 patients 33 were females and 13 were males. The age range was 71 years to 92 years. The mean age was 80 years.

Age	Male	Female	Total
70 - 75	02	05	07
76 - 80	05	21	26
81- 85	03	04	07
86 - 90	03	02	05
91 - 95	00	01	01
Total	13	33	46

Table 1: *Age distribution.*

All were osteoporotic 31B1 and 31B2 fractures. The majority of the 31B1 fractures were seen in the males while the 31B2's were common among the females. The 31B1's was common in the relatively younger age groups while the more elderly had 31B2 fractures.

AO Fracture type	Male	Female
31B1	11	08
31B2	02	25

Table 2: *Fracture pattern according to gender.*

Age	31B1	31B2
70 - 75	17	00
76 - 80	01	00
81 - 85	00	15
86 - 90	00	11
91 - 95	00	01

Table 3: *Age distribution of fractures.*

All 46 were available for 6 weeks' review while only 30 were followed up at 03 months. All 30 patients followed up at 03 months were available for follow up at 06 months. Only 28 were available for follow up at one year. The two patients lost to follow up were not due to deaths. There were 08 deaths at 03 months. There were no deaths related to operative complications.

Nine patients had wound infection which was treated successfully with antibiotics. No implant removal was necessary. No deep infections were reported. Out of 46 patients only one patient had one of the screws cut out. This was revised to a bipolar hemi-arthroplasty. None of the patients had collapse of the femoral head due to avascular necrosis in this series.

Wound infections	09
Deep infections	00
Screw cut out	01
Implant failure	00
Symptomatic Deep Vein Thrombosis	00
Avascular necrosis	01
Deaths 06 weeks	05
Deaths 03 months	03
Deaths 06 months	00

Table 4: *Complications.*

The average operating time was 45 minutes and the range was 30-65 minutes. Superficial wound infections were noted in patients who had an operating time more than 60 minutes.

Operating time minutes	Number	Wound infections
30 - 45	17	00
46 - 60	21	01
61 -75	08	08
> 75	00	00

Table 5: *Operating time and wound infection.*

The incidence of avascular necrosis and collapse of the head was seen in one case over a one-year period of follow up. This was the patient who had one of the screws cut out and required a revision into a hemiarthroplasty.

Discussion

The two most commonly used implants for the fixation of intra-capsular fractures of the neck of the femur are the multiple parallel screw method and the sliding hip screw method. The sliding screw allowed for collapse of the bone at the fracture site and the multiple screw technique allowed for rotational stability. Each technique has its benefits and challenges. The parallel screws need to be parallel to each other for them to be effective in allowing the fracture to collapse with weight bearing. The dynamic hip screw technique requires an additional lag screw to provide rotational stability or during insertion of the dynamic hip screw a second K wire needs to be used to prevent the head of the femur spinning off. The jig of the TARGON plate allows screws to be inserted perfectly parallel to each other and the telescopic screws allow collapse of the fracture without the screws backing out laterally and causing trochanteric irritation requiring metal work removal subsequently.

These two implants have been compared in their various features in six randomised trials using 772 participants. With sliding screws, the incidence of fracture healing complications were lower (28% versus 33%). The sliding hip screw was associated with more wound healing complications probably due to the slightly longer time needed for the procedure. The parallel screws can be inserted via a percutaneous technique with three stab incisions but the TARGON plate needs an incision of less than 5 cm for insertion. The length of the skin

incision is less than that required for insertion of a two holed dynamic hip screw plate. Only 09 of 46 patients developed superficial wound infections in our series. The wound infections were associated with an operating time longer than 60 minutes. The longer operating times were noted during the initial period of the plate being used as the surgeons had a learning curve. As the plate system became more familiar the operating time decreased and no wound infections were noted.

Avascular necrosis (AVN) is a major complication of intracapsular fractures that have been fixed. In our small series we had one patient who developed AVN (2.17%). This is an encouraging result.

The TARGON is a design which incorporates the advantageous features of both implants. This device provides the rotational stability with the three parallel screws. It also enables collapse of the fracture without lateral protrusion of screws and the plate of the TARGON provides the lateral buttress support. The implant is Magnetic Resonance Imaging compatible and is light.

The jig allowed the three screws which are telescopic, to be positioned in a triangular configuration providing rotational stability. Due to the jig the screw can be placed perfectly parallel allowing collapse, which is further facilitated by the telescopic nature of the screws. We found that removing the handle of the jig helps to manoeuvre the jig more easily especially in the case obese patients. The handle of the jig tends to catch with prominent soft tissues in the obese patient group. By removing it, we found the jig to be more manoeuvrable.

Conclusion

We conclude from our limited experience that the TARGON device appears to be a promising implant in the treatment of intra-capsular fractures of the femur.

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