Injury, Int. J. Care Injured 47S7 (2016) S44–S48

Contents lists available at ScienceDirect

Injury

journal homepage: www. elsevier.com/locate/Injury

Clinical results of surgical treatment for femoral neck fractures with the Targon® FN

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KEYWORDS

femoral neck fracture
TFN
clinical results
complications

ABSTRACT

84 cases (male 15 cases, female 69 cases) of intracapsular femoral neck fractures treated with the Targon® FN (TFN) were available for review.
Mean patient age was 74.0 years (range 36–100 years). 55 fractures were undisplaced whereas 29 were displaced. Mean follow-up term was 16.4 months. We surveyed patient mobility before injury and after operation as well as postoperative complications.
On a four-stage mobility scale we found 3/55 patients with undisplaced fractures loosing mobility by more than one grade (5.5%), whereas 5/29 (17.2%) displayed this kind of functional decline after displaced fractures. Overall postoperative complication rate was 10.7% (9 cases). These complications included nonunion (1 case), avascular necrosis (7 cases) and peri-implant fracture (1case).
Internal fixation with the TFN seems to have an acceptable complication rate in both undisplaced and displaced fractures compared to other recent studies.

Introduction

Treatment methods for femoral neck fractures continue to be a topic of vivid discussion amongst clinicians [1–5]. Major strategies are either femoral head preservation by internal fixation or femoral head replacement by total hip arthroplasty (THA) or hemiarthroplasty (HA).

Many articles point out the higher complication rates in displaced fractures due to impaired blood supply to the femoral head [6–11]. Cons et al. reported a nonunion rate of 6% and an avascular necrosis rate of 4% in 375 undisplaced neck fractures [7]. In displaced fractures a meta-analysis reported an incidence of nonunion of 33% and avascular necrosis of 16% [8].

An innovative concept of an angular stable locking plate system for femoral neck fractures was introduced in 2010 [2]. The Targon® FN (TFN; B.BRAUN AESCULAP, Germany) consists of a short locking plate which is combined with up to four telescopic screws (TeleScrews) and two distal locking screws. This device is designed to give a better rotational and angular stability than other contemporary internal fixation devices used for femoral neck fractures. However, some difficulties in its surgical procedure occurred when using the TFN for femoral necks with small dimensions, which is a common finding in Japanese women. In 2011 we developed an additional guide instrument as a solution for this issue. The aim of this study is to report our institutional experience in the treatment of femoral neck fractures managed with the Targon® FN system.

Patients and methods

Between June 2011 and November 2014 patients admitted in our institution with femoral neck fractures (intracapsular) requiring stabilization were eligible to participate. Patients with pathological fractures, or extracapsular fractures were excluded. Informed consent for the study was obtained from all participants.

Surgical procedure

Patients were positioned supine. Reduction was achieved by gradual longitudinal traction and internal/external rotation under fluoroscopic control, until anatomical alignment was successful. The first guide wire is placed in the centre of the femoral head on the AP/Lateral radiographs with the drill aiming guide. According to the standard operative technique, the drill aiming guide, which is connected to the side plate, should be used to place the guide wires for TeleScrew placement.

However, there might occur difficulties during this step of the procedure [12]. In some cases the aiming guide appears to be too large

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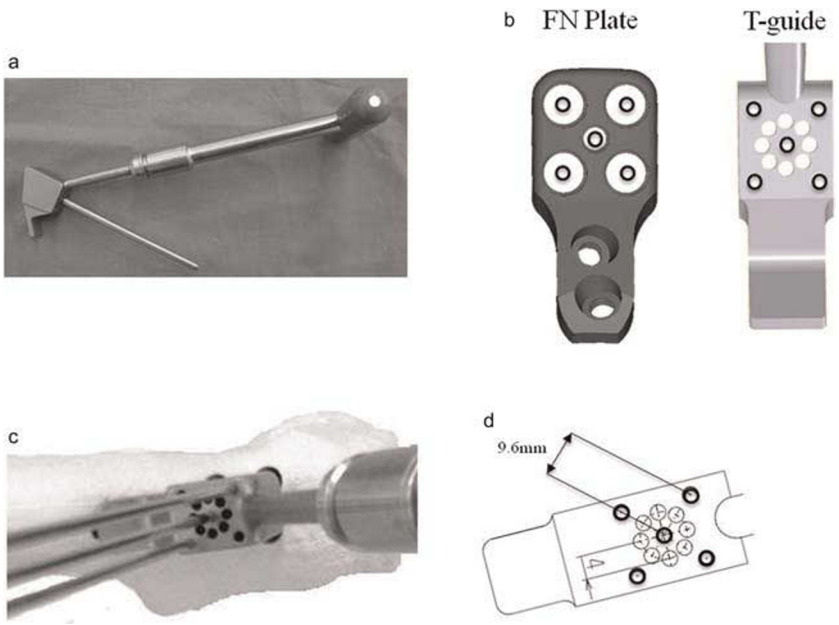

Fig. 1. (a) a photograph of T-guide, (b) Targon FN plate (left) and T-guide (right). 5 holes of the plate and the T-guide (black circles) correspond to each other, (c) This small device allows for a more direct intraoperativeview, facilitating guide wire placement (d) 8 holes around the centre hole allow for easy correction of bad guide wire positions.

for small-dimensioned Japanese femora, resulting in several attempts to achieve correct implant placement. Therefore, we developed a T-shaped guide instrument (T-guide) with the same size and shape as this side plate to make this step easier [13]. This device provides the surgeon with a direct view to confirm the position of the plate and TeleScrews (Fig. 1).

All patients received prophylactic antibiotics and thromboprophylaxis (low molecular heparin) for a period of 6 weeks. Following discharge from the hospital all patients were followed up in the outpatient clinic for clinical and radiological assessment at 4, 8, 12 weeks and 6, 12, 24 months thereafter and/or longer as it was indicated.

Full weight bearing was allowed for all patients except for younger patients with displaced fractures, who were advised to mobilise partial weight bearing or a period of 6 weeks and then progress to full weight bearing.

We investigated operative time, mobility before injury/after surgery, and complications after surgery. Complications analysed included infection, nonunion, avascular necrosis, peri-implant fracture, and implant removal due to discomfort.

Mobility was evaluated using four walking grades (walk without assistance, walk with cane, walks with the assistance of a hand-held appliance, and wheel chair). Clinical results were evaluated at the final follow-up. Paired T-test was used to check for differences of means, and significance level was set at $p < 0.05$.

Results

In total 116 were recruited. However, 32 patients were lost to follow-up, thus, 84 patients (15 males and 69 females) formed the basis of this study. Mean follow-up was 16.4 months (6–45 months) for undisplaced fractures and 20.1 months (6–42 months) for displaced fractures (Table 1).

55 (65%) fractures were undisplaced with a male/female (m/f) ratio of 8/47. In the 29 (35%) displaced fractures, the m/f ratio was 7/22 (Fig. 2).

Average patient age was 74 years (37–100 years) in undisplaced fracture patients. Patients with displaced fractures appeared to be younger with a mean age of 66 years (36–94 years). Mean time to surgery from admission was 1.1 days (0–3 days) in the group of undisplaced fractures and 1.2 days (0–3 days) days for displaced fractures. Mean operative time for undisplaced fractures was 41.7 minutes (28–61 min). Operative time for displaced fractures was 47.5 minutes (32–89 min) and appeared to be slightly longer. However, this difference did not reach significance ($p < 0.05$).

Three cases of undisplaced fractures (5.5%) and five cases of displaced fractures (17.2%) experienced a decrease of mobility by more than 1 grade, whereas 76 patients (88.5%) could maintain their grade of pre-injury mobility (Fig. 3).

Overall complication rate was 10.7% (9 cases). Nonunion occurred in one displaced fracture (1.2%). The rate of avascular necrosis was 8.3% (7 patients); this complication occurred in three patients with undisplaced fractures and four patients with displaced fractures. One peri-implant fracture was noticed (1.2%), (Table 2).

Table 1.
Patient data

Charcteristic	Undisplaecd type ($n = 55$)	Displaced type ($n = 29$)
Age (years)	74 (range 37~100)	66 (range 36~94)
Gender	Male ($n = 8$)	Male ($n = 7$)
	Female ($n = 47$)	Female ($n = 22$)
Admission to operation (days)	1.1 (0~3)	1.2 (0~3)
Follow-up term (months)	16.4 (6~45)	20.1 (6~42)

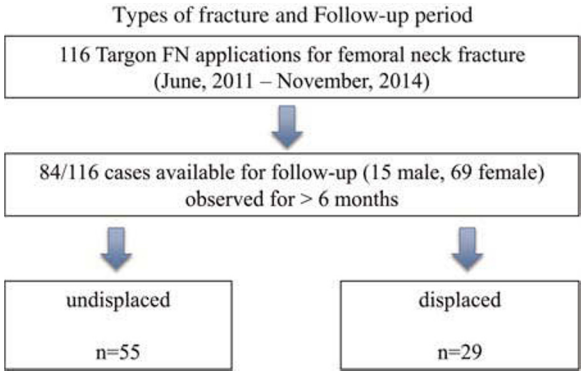

Fig. 2. Undisplaced/displabed fractures and more than >6 months follow-up.