J Orthop Sci
DOI 10.1007/s00776-013-0410-5

ORIGINAL ARTICLE

Posterior buttress plate with locking compression plate for Hoffa fracture

Tomonori Tetsunaga · Toru Sato · Naofumi Shiota · Masahiro Yoshida · Yusuke Mochizuki · Tomoko Tetsunaga · Arubi Teramoto · Yoshiki Okazaki · Kazuki Yamada

Received: 27 October 2012 / Accepted: 29 April 2013

Abstract
Background Many difficulties are associated with treating fractures of the posterior condyle of the femur (Hoffa fractures). Anatomical reduction and internal fixation are optimum for such intra-articular fractures. Some surgeons use anteroposterior screws to achieve direct stability. However, screw fixation is not adequate in some cases. To increase stability, we treat Hoffa fractures with a posterior buttress plate; we use a twisted, 1/3 tubular plate at the posterior surface and a supplementary, locking compression plate (LCP) for additional stability.
Methods Patients who had sustained Hoffa fractures between January 2006 and March 2009 were included in this study. Patients comprised three males and two females with a mean age of 73.6 years at the time of surgery. A 3.5-mm 1/3 tubular plate was twisted and applied to the posterolateral aspect of the distal femur. This was combined with an LCP on the distal femur to achieve a rafting effect.
Results All fractures were healed within 15 weeks. There were no instances of nonunion, infection, or implant removal. The mean range of motion was −3° to 121°. Four patients had no pain in the treated limb and one had mild pain on weight bearing. The average Oxford Knee Score was 44.6 points. All patients achieved satisfactory joint function and regained their walking ability with good clinical results.
Conclusions Improved stability associated with this technique enables patients to begin range-of-motion training and return to their normal activities sooner; this resulted in good outcome.

T. Tetsunaga (✉) · T. Sato · N. Shiota · M. Yoshida · Y. Mochizuki · A. Teramoto · Y. Okazaki · K. Yamada
Department of Orthopaedic Surgery, Okayama Medical Center, 1711-1 Tamasu, Kitaku, Okayama 701-1192, Japan
e-mail: tomonori_t31@yahoo.co.jp

T. Tetsunaga
Department of Orthopaedic Surgery, Okayama University Hospital, 2-5-1 Shikata-cho, Kitaku, Okayama 700-8558, Japan

Introduction

Coronal plane fractures of the femoral condyle are rare fractures first reported by Hoffa in [1]. The objective in treatment of articular fractures is to achieve anatomical reduction of the articular surface. Open reduction and internal fixation are mandatory for good long-term results. Mize [2] suggested that K-wires and absorbable pins are usually not strong enough for Hoffa fractures. Some surgeons use screws to achieve good anterior to posterior stability [3–6]. However, it is difficult to insert screws perpendicular to the fracture site. Internal fixation with low stiffness may result in a large shear strain at the fracture site, disrupting osteogenesis and promoting nonunion [5, 7, 8].

To increase the stability of the fracture site, we utilize a 1/3 tubular plate as buttress plate and a locking compression plate (LCP) for Hoffa fractures. This method has enabled us to obtain good fixation that results in early range of motion for Hoffa fractures. The purpose of this study was to evaluate the clinical outcome of our surgical technique in the treatment of Hoffa fractures.

Patients and methods

Five patients who had sustained intra-articular fractures of the distal femur between January 2006 and March 2009 were included in this study. Mean patient age was

Published online: 04 June 2013

73.6 years (range 52–98 years). Three patients were male, and two were female. Two patients sustained injury in motor vehicle accidents and three had fallen from a height. Their fractures were classified in accordance with Orthopaedic Trauma Association (OTA) criteria [9]. One patient was classified as 33-B1 and B3, and four were classified as 33-B3. All fractures were closed injuries that were managed acutely (Table 1). Two fellowship-trained orthopaedic traumatologists (T.S. and T.T.) reviewed all preoperative and postoperative radiographs (anteroposterior and lateral) and computed tomographic (CT) scans to identify Hoffa fractures. Functional and anatomic status at follow-up were evaluated by use of the Oxford knee score (OKS) [10]. The OKS can vary from 0 to 48, where 48 is the best possible outcome. All patients provided written informed consent, and approval was obtained from the hospital board of ethics.

Surgical technique

A lateral incision was made and the distal femur was approached between the iliotibial tract and the biceps femoris muscle. The fracture was anatomically reduced and held under compression with pointed bone clamps. A 3.5-mm 1/3 tubular plate was twisted and applied to the posterolateral aspect of the distal femur (Fig. 1). Drilling for screw placement was performed proximal to distal, to produce a buttress effect. LCP distal femur plates (Synthes, Oberdorf, Switzerland) were used in combination to achieve a rafting effect.

Postoperatively, all patients began range-of-movement of the knee and strengthening exercises of the quadriceps the day after surgery. The patients were allowed to use a wheelchair 2 days after the operation. Partial weight bearing with crutches or a walker was started 6 weeks after the operation. Full weight bearing was allowed 12 weeks after the operation.

Fig. 1 Photograph showing the 1/3 tubular plate and the LCP. The Hoffa fracture is first fixed with a 1/3 tubular plate; the LCP is then applied to the distal femur as a neutralizing plate

Results

All fractures were followed for a minimum of 24 months (range 24–48 months). Average fracture healing time was 12 weeks (range 10–15 weeks). There were no instances of nonunion. The mean range of motion was −3° (range −10° to 0°) to 121° (range 110° to 150°). Four patients (80 %) had no pain in the treated limb; one patient (20 %) had mild pain on weight bearing. There were no superficial or deep infections or implant removals. The OKS (mean

Table 1 Patients' demographics

No.	Age/ Gender	Mechanism of injury	AO fracture type	Associated injury	Approach	Implants	Healing time (months)	Follow up (months)	ROM		Oxford knee score (Pts)	Past history
									Ext. (°)	Flex. (°)		
1	58/F	Traffic accident	33 B3	–	Lateral	LCP-DF + 1/3 tubular plate	15	48	0	150	45	
2	71/M	Fall from a height	33 B3	–	Lateral	LCP-DF + 1/3 tubular plate	12	24	0	120	47	THA of the ipsilateral leg
3	90/F	Fall from a height	33 B1, B2	–	Lateral	LCP-DF + 1/3 tubular plate	12	48	−10	115	40	Amputation of the lower leg
4	52/M	Fall from a height	33 B3	–	Lateral	LCP-DF + 1/3 tubular plate	12	24	0	112	48	
5	98/M	Traffic accident	33 B3	Head banging	Lateral	LCP-DF + 1/3 tubular plate	10	24	−5	110	43	

ROM range of motion, *Ext.* extension, *Flex.* flexion, *LCP-DF* Locking compression plate-distal femur, *THA* Total hip arthroplasty