ARTHROSCOPY OF MENISCAL INJURIES WITH TIBIAL PLATEAU FRACTURES

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We examined 36 consecutive patients with closed tibial plateau fractures under anaesthesia and by diagnostic and operative arthroscopy before treating them by closed or open reduction and internal fixation.

Following the principle of Hohl (1967) (Fig. 1) there were 9 minimally displaced fractures (type I), 6 with local depression (type II), 13 with split depression (type III), 7 with total condylar depression (type IV), and one bicondylar comminuted upper tibial fracture (type V). Seventeen (47%) of knees were found to have associated meniscal injuries which required surgical treatment; five repairs and 12 partial meniscectomies. Neither the type of plateau fracture nor the presence or absence of ligament injury correlated with meniscal tear. There were no intraoperative or postoperative complications from arthroscopy.

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The menisci play an important part in the function of the knee but few studies of tibial plateau fractures have discussed the associated meniscal injuries. Bradford et al (1950) stated that meniscal tears were uncommon and Palmer (1939) observed that late meniscectomy was seldom needed after plateau fracture. More recent studies have stressed the importance of the meniscus in tibial plateau fractures. Preservation and repair of the meniscus have been advocated for meniscal injuries, which have been reported to occur in 10% to 19% of plateau fractures (Barrington and Dewar 1965; Smillie 1970; Novikov 1972; Schulak and Gunn 1975; Moore 1981; Moore, Patzakis and Harvey 1987). More recently, Nicolet (1965)

found that meniscal injury was present in 40% of tibial plateau fractures and suggested the need for arthrotomy. Ruf (1966) found 13 meniscal tears in 43 plateau fractures (32%) and Rinonapoli (1962) diagnosed meniscal lesions in 86% of 101 plateau fractures treated surgically. Other studies have noted that the meniscus can be wedged in the fracture site preventing reduction and necessitating arthrotomy (Cubbins, Conley and Seiffert 1929; Johansson 1930; Palmer 1951). A few papers have described the role of arthroscopy in the management of plateau fractures although none has dealt with the injured meniscus (McLennan 1982; Caspari et al 1985; Jennings 1985; Pino 1986).

Our aim was to evaluate by arthroscopy the incidence of meniscal injury in fractures of the tibial plateau.

PATIENTS AND METHODS

We reviewed 36 consecutive patients admitted to a trauma service at the Los Angeles County/University of Southern California Medical Centre, with closed tibial plateau fractures. They were treated by examination under anaesthesia and diagnostic and operative arthroscopy, followed by open or closed reduction and internal fixation by the AO technique. No patient had previously suffered pain or dysfunction of the injured knee.

Arthroscopy was performed under a tourniquet with the patient supine and the leg hanging to the side or off the end of the table. Lidocaine with 0.5% epinephrine (30 ml) was injected into the knee 30 minutes before the examination. A powered shaver was used to facilitate removal of clot and debris.

Injured menisci were trimmed, partially excised or repaired as indicated and fragments of loose articular cartilage and bone were removed. When possible the fracture was reduced under arthroscopic control.

Postoperative care was appropriate to the individual fracture, but generally involved a period of immobilisation with the knee in extension followed by exercises. Weight-bearing was allowed at three to four months as indicated.

Following the principle of Hohl (1967) (Fig. 1) there were 9 minimally displaced fractures (type I), 6 with local depression (type II), 13 with split depression (type III), 7 with total condylar depression (type IV) and one bicondylar comminuted upper tibial fracture (type V).

There were 27 men and nine women with an average

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Fig. 1

Classification of tibial plateau fractures according to the principle of Hohl (1967).

age of 34.4 years. Six patients had been struck by cars and one had been injured playing soccer and five by altercation. Twelve patients had been injured in motor-vehicle accidents and 12 from falls or jumps. Eighteen patients had associated injuries including fracture of other bones, closed-head injuries, and lacerations.

RESULTS

All the patients had a complete arthroscopic examination. In most cases visualisation of the fracture and reduction were possible. Fractures around the tibial eminence and the periphery of the plateau were the most difficult to see.

There were 17 knees (47%) with meniscal injuries requiring operative treatment. In addition, many intact menisci showed adjacent synovitis and haemorrhage. Most of the tears were in the posterior half of the meniscus. There were 13 tears of the lateral meniscus, five of which were peripheral (one bucket-handle); all were repaired by standard techniques. There were three radial and five complex tears which required partial meniscectomy. No pattern of plateau fracture could be correlated with these lateral meniscal tears. The four tears of the medial meniscus all required partial meniscectomy and all were associated with type-IV fractures (Fig. 1).

Arthroscopy also showed two torn and three attenuated anterior cruciate ligaments. No tears of the posterior cruciate ligament were found but there were three torn medial collateral ligaments without associated medial meniscal tears. None of these ligament injuries was treated surgically. There was no correlation between ligament tears and meniscal injuries. There were no postoperative complications from the arthroscopy.

Eleven fractures were treated by closed manipulation

under arthroscopic control, one patient having a partial meniscectomy. In 15 knees open reduction was performed and internal fixation by the appropriate AO technique with plates and screws. Ten of these 15 knees had a torn meniscus. Four peripheral lateral meniscal tears were repaired, while four lateral menisci and two medial menisci underwent partial meniscectomy. Ten fractures were treated by minimal incision, reduction under arthroscopic control and internal fixation. Six of these were associated with meniscal tears. Two lateral meniscal tears were repaired and two lateral and two medial tears underwent partial meniscectomy.

DISCUSSION

There is much controversy regarding the management of the soft-tissue injuries associated with tibial plateau fractures and no published account of the details of meniscal pathology.

Arthroscopy provides a safe, quick and precise method of diagnosis. It is difficult to visualise the posterior horn of the contralateral meniscus through a medial or lateral arthrotomy. The cruciate ligaments can only be adequately seen through an anterior incision. Using the arthroscope we gained an excellent view of all these structures and encountered no complications. To prevent the potential deleterious effects of excessive fluid extravasation, the authors recommend an efficient arthroscopy with constant vigilance of the knee and leg tissues by a surgeon with strong arthroscopic skills.

The thorough irrigation and washing out of joint debris were additional advantages of the arthroscopic procedure which added only 20 to 30 minutes to the length of the operation. Even after arthrotomy the

arthroscope can be used to illuminate and visualise joint structures which are otherwise difficult to see.

Although none of our patients gave a history of previous knee symptoms meniscal abnormalities are known to be present in the asymptomatic population. Cadaver studies have discovered meniscal lesions in 5% to 18% of knees although the correlation of these abnormalities with symptoms in life is unknown (Noble and Hamblen 1975; Casscells 1978; Fahmy, Williams and Noble 1983). Meniscal abnormalities have been detected by MRI in 25% of an asymptomatic population (Kornick et al 1990). In our series 47% of knees with plateau fractures had meniscal tears.

We found no correlation between the fracture pattern and meniscal injury, except that of the 25 fractures which required internal fixation 16 (64%) had meniscal tears while of the 11 fractures treated by closed methods only one had a meniscal tear.

Our experience suggests that the state of the menisci needs to be investigated in every tibial plateau fracture. Whether this should be by arthroscopy or by MRI remains an open question. In the seven patients in whom we used MRI the scan was positive in six, in all of whom meniscal tears were confirmed at surgery.

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REFERENCES

- Barrington TW, Dewar FP.** Tibial plateau fractures. *Can J Surg* 1965; 8:146-52.
- Bradford CH, Kilfoyle RM, Kelleher JJ, Magill HK.** Fractures of the lateral tibial condyle. *J Bone Joint Surg [Am]* 1950; 32-A:39-47.
- Caspari RB, Hutton PM, Whipple TL, Meyers JF.** The role of arthroscopy in the management of tibial plateau fractures. *Arthroscopy* 1985; 1:76-82.
- Casscells SW.** The torn or degenerated meniscus and its relationship to degeneration of the weight-bearing areas of the femur and tibia. *Clin Orthop* 1978; 132:196-200.
- Cubbins WR, Conley AH, Seiffert GS.** Fractures of the lateral tuberosity of the tibia with displacements of the lateral meniscus between the fragments. *Surg Gynecol Obstet* 1929; 48:106-8.
- Fahmy NRM, Williams EA, Noble J.** Meniscal pathology and osteoarthritis of the knee. *J Bone Joint Surg [Br]* 1983; 65-B:24-8.
- Hohl M.** Tibial condylar fractures. *J Bone Joint Surg [Am]* 1967; 49-A:1455-67.
- Jennings JE.** Arthroscopic management of tibial plateau fractures. *Arthroscopy* 1985; 1:160-8.
- Johansson S.** Ein Operierter Fall von Spaltbruch den Schienbeinkopfes. *Acta Chir Scand* 1930; 67:476-81.
- Kornick J, Trefelner E, McCarthy S, et al.** Meniscal abnormalities in the asymptomatic population at MR imaging. *Radiology* 1990; 177: 463-5.
- McLennan JG.** The role of arthroscopic surgery in the treatment of fractures of the intercondylar eminence of the tibia. *J Bone Joint Surg [Br]* 1982; 64-B:477-80.
- Moore TM.** Management of tibial plateau fractures. In: Moore TM, ed. *AAOS symposium on trauma to the leg and its sequelae*. St Louis, etc: CV Mosby, 1981; 56-66.
- Moore TM, Patzakis MJ, Harvey JP.** Tibial plateau fractures: definition, demographics, treatment rationale, and long-term results of closed traction management or operative reduction. *J Orthop Trauma* 1987; 1:97-119.
- Nicolet A.** Die Meniscus Verletzung bei Tibiakopffrakturen. *Langenbeck Arch Klin Chir* 1965; 313:544-5.
- Noble J, Hamblen DL.** The pathology of the degenerate meniscus lesion. *J Bone Joint Surg [Br]* 1975; 57-B:180-6.
- Novikov NV.** Treatment tactics in fractures of the tibial condyle associated with injuries to the menisci. *Ortop Traumatol Protez* 1972; 33:17-21.
- Palmer I.** Compression fractures of the lateral tibial condyle and their treatment. *J Bone Joint Surg* 1939; 21:674-80.
- Palmer I.** Fractures of the upper end of the tibia. *J Bone Joint Surg [Br]* 1951; 33-B:160-6.
- Pino AE.** The role of arthroscopy in diagnosis and treatment of fractures about the knee. *Orthop Trans* 1986; 10:633.
- Rinonapoli E.** Le lesioni del menisco nelle fratture del piatto tibiale. *Arch Putti* 1962; 16:319-34.
- Ruf P.** Contribution on the treatment of fractures of the head of the tibia. *Monatsschr Unfallheilkd Versich Versorg Verkehrsmed* 1966; 69: 74-9.
- Schulak DJ, Gunn DR.** Fractures of the tibial plateaus: a review of the literature. *Clin Orthop* 1975; 109:166-77.
- Smillie IW.** *Injuries of the knee joint*. 4th ed. Edinburgh, etc: Livingstone, 1970.