KNEE LIGAMENT INJURIES IPSILATERAL TO FEMORAL SHAFT FRACTURES

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INTRODUCTION

The combination of femoral shaft fracture and ipsilateral knee ligament injury has received attention in the orthopaedic literature. Ritchey et al. in 1958 reported a 17 percent incidence of "unstable knee injuries" ipsilateral to femoral fractures in a series of thirty automobile dashboard impact injuries. In 1968, Omer et al. reported one knee ligament injury in a series of 25 patients with either tibial or femoral fractures. In 1968, Pederson and Serra reported 10 patients with the combination of knee ligament injury and femoral fracture. Of the 6 cases that gave accident details, 5 were pedestrian accidents. The total number of femoral fractures was not reported in this series so an incidence is unavailable. Fraser et al., in 1978, reported retrospectively a 5 percent incidence of ipsilateral knee ligament laxity in 222 patients seen acutely and a 39 percent incidence of ligamentous "laxity" among 69 patients seen in follow-up. In 1978, Dunbar and Coleman reported that 14 of 20 patients studied retrospectively showed at least "minimal" knee laxity ipsilateral to femoral fracture and 5 of 20 showed "significant" laxity. Walker and Kennedy in 1980 reported retrospectively a 49 percent incidence of ligamentous injury in 54 fractures. They reported that femur fractures occurred in motor vehicle accidents (48), athletic injuries (4), or falls (2). They, however, did not give the incidence of ligamentous damage with each fracture etiology. Additionally, they imply that dashboard type accidents cause most of the knee ligament injuries. With a mean follow-up of 5 years, Rowntree and Getty reported in 85 patients a 45 percent incidence of ligamentous laxity ipsilateral to femoral shaft fractures. Walling et al. prospectively reported a 33 percent incidence of this injury combination, and they reported the injury occurrence in 6 of 10 motorcycle accidents and 2 of 7 pedestrian accidents. More recently in 1988, Moore et al. reported a 5 percent incidence of this injury combination in a retrospective study of 320 femoral shaft fractures.

There is, therefore, a large difference in the reported incidences (5 to 70 percent). Moore et al. called for further studies to consider the nature of the trauma in order to "have a better understanding of the frequency of the injury and whether patterns exist." The purpose of this study is to identify accident patterns that more likely result in the combined femur fracture and knee ligament injury. Also, we will discuss possible reasons for this disparity in incidence reports.

METHODS AND MATERIALS

The medical records of patients with femoral shaft fractures treated at the University of New Mexico Medical Center from the years 1981-1987 were reviewed. Patients with pathologic fractures or fractures secondary to missile injuries were excluded. Pediatric patients, patients with a history of previous femur fractures and patients with previous knee injuries were also excluded. A total of 157 patients with 163 femoral shaft fractures composed the study group. The accident type as well as the grade of ipsilateral knee ligament instability were recorded.

Clinical examination under general anesthesia after femoral stabilization and observation at arthroscopy were used to determine ipsilateral knee ligament injury. Knee ligament instabilities were graded using the Standard Nomenclature of Athletic Injuries formulated by the Committee on the Medical Aspects of Sports within the American Medical Association.

RESULTS

Of the 163 femoral shaft fractures, 19 had one or more ipsilateral knee ligament instability patterns for an overall incidence of 11.6 percent. Two of the 83 fractures sustained in automobile accidents showed this injury combination, an incidence of 2 percent. Six of the 26 patients sustaining femoral shaft fractures sustained in pedestrian versus motor vehicle accidents displayed some form of knee ligament instability. This produced an incidence of 23 percent. Twelve of the 25 patients sustaining femoral shaft fractures from motorcycle accidents had ipsilateral knee ligament instability, an incidence of 34 percent. None of the 18 femoral shaft fractures sustained in lower energy sporting events had ipsilateral knee ligament instability. The average patient age was 27 with a range from 18-42 years.

The medial collateral ligament (MCL) was the most commonly injured (13). The anterior cruciate ligament...
(ACL), the posterior cruciate ligament (PCL), and the lateral-collateral ligament (LCL) were injured in 6, 5 and 3 patients respectively. Six patients sustained injuries to 2 knee ligaments. Three of these patients had combined MCL and ACL instability. Fifteen of the ligament injuries were Grade II, 10 were Grade III and no Grade I injuries were identified. Eleven of the 19 patients had 2 or more major additional fractures (tibia, pelvis, ankle or humerus).

**DISCUSSION**

The data collected in this study suggest that motorcycle accidents or motor vehicle versus pedestrian accidents causing femoral shaft fractures have a relatively high incidence of ipsilateral knee ligament instability. In this series, motor vehicle passengers sustaining femoral shaft fractures had a low rate of ipsilateral knee ligament injury. Although a common cause in other series, the motor vehicle dashboard injury was an uncommon cause of ipsilateral knee ligament injuries in our follow-up.10

Discussions of the trauma types causing this combination injury have been published but no large series describes the incidence of the various trauma types.5,11 Multiple trauma has been implicated in patients sustaining this injury combination.4 Our results showed multiple trauma to be very common in both femoral fractures without ipsilateral knee ligament injury (64 percent) and with ipsilateral knee ligament injury (68 percent). Low energy trauma, such as sporting injuries, made this injury combination very unlikely (0 percent in our series).

We feel the disparity in previously reported incidences of this injury combination is related to three factors. First, selection of patients is important. If patients with pathologic fractures or missile induced fractures are included then a lower incidence will be reported. Second, prospective studies tend to report higher incidences, especially if the authors report minimal ligamentous injury. Retrospective studies, in contrast, report lower incidences due to inadequate documentation, exclusion of minor ligament injuries and missed ligament injuries. Third, studies basing their reports on the initial evaluation report lower incidences because of inadequate documentation and missed diagnoses later reported in follow-up. Studies which report a longer follow-up have higher incidences. However, these reports may select out problem patients willing to return for long-term follow-up (often a low percentage of the initial number) and artificially raise the incidence.

**SUMMARY**

Patients incurring femoral shaft fractures in motorcycle or pedestrian versus motor vehicle accidents are at high risk for ipsilateral knee ligament injuries. The most common ligament lesion in our series was either Grade II or Grade III MCL injury. In our follow-up, motor vehicle accidents were an uncommon cause of this injury combination, and it did not occur as a result of sporting activity injuries. We found an 11.6 percent incidence of ipsilateral knee ligament injuries in patients with femoral shaft fractures. We recommend future studies to better describe the mechanism causing this injury combination.

**BIBLIOGRAPHY**