INTRODUÇÃO
In literature, knee ligament injuries constitute a frequent topic in a large number of scientific publications, particularly the anterior cruciate ligament (ACL) injury. However, in recent years, knee’s posterior cruciate ligament (PCL) injuries have received special attention, which is evidenced by the increasing number of scientific articles addressing that ligament(1-2).

Form an anatomical point of view, knee’s posterior cruciate ligament (PCL) is fixed on the anterior half of the axial surface of femoral internal condyle, protruding at caudal and medial directions, by the intercondylar incisure towards its tibial insertion located posterior, inferior and juxta-lateral to the mid line of the tibial plateau. It acts as a major posterior knee stabilizer, limiting posterior tibial translation in relation to the femur(3-5).

PCL injuries are estimated to account for 20% of knee ligament injuries. That incidence is higher especially in cases resulting from high-energy trauma, such as in motorcycle and car accidents, while, in an athletic population, this injury is more closely associated to contact sports(1,2).

For treating a PCL injury, alternatives such as tendon graft, fixation system, surgical technique are not yet regarded as a universally accepted treatment of choice. However, in the presence of PCL bone avulsion in its tibial insertion, a consensus exists towards surgical intervention, this being considered as the most favorable way from surgical and secondary healing perspectives(6,7,8).

The surgical technique employed here consists of a posterior knee approach, re-insertion and fixation of the PCL bone fragment into its anatomical bed located on posterior tibial surface. In literature, this procedure is reported as sufficient for re-establishing ligament integrity and function(6,8,9).

This article aims to assess twenty-one cases of PCL avulsion fractures surgically treated, and to compare achieved clinical outcomes to objective (posterior draw test) and subjective (Lysholm scale) evaluations.

CASE SERIES
From January 1997 to December 2005, 21 patients with knee’s posterior cruciate ligament avulsion fractures, in its tibial insertion, were submitted to surgical therapy. Sixteen patients were males, and 05 patients were females. Patients’ ages ranged from 15 to 53 years (mean = 30 years), and 57% of the injuries were secondary to motorcycle accidents (Chart 1). The injury was diagnosed by means of X-ray images of the knee at AP and lateral planes, and by physical examination made at the emergency room during primary care, and intra-operatively. Figure 2-A shows the PCL bone fragment avulsion in its tibial insertion evidenced by lateral-plane X-ray image. In this case series, no peripheral ligament injuries requiring surgical intervention were detected.

Description of the surgical technique
Anesthetized patients were positioned at horizontal ventral decubitus, and the limb to be operated was kept with a pneumatic garrote during the procedure. In 6 cases, the Trickey’s access port(10) (“S”) was used, and in 15 cases, a simplified incision described by Burks(11) (inverted “L”) was employed (Figures 1A and 1B). After skin incision, the medial portion of the gastrocnemius muscle was flapped aside, and then medial arthrotomy and identification of

SUMMARY
We assessed 21 patients (16 males and 5 females), with mean age of 27.6 years who underwent surgical treatment for PCL avulsion fracture. In 57% of the cases, injuries were secondary to motorcycle accidents and 19% resulted from car accidents. Injuries on knee’s anterior surface were detected in 72% of the cases. The surgical procedure involved posterior approach and bone fragment fixation using nut and screw in 18 cases, the trans-bone suture loop fixation in 3 cases with small bone fragments. In 91% of the cases, surgery was performed within the first two weeks following injury. The patients were objectively (posterior drawer test) and subjectively (Lysholm scale) re-evaluated after a minimum follow-up period of 12 postoperative months. The statistical analysis of objective and subjective assessments did not demonstrate any significant difference (p = 0.05). The satisfactory results of the subjective clinical postoperative evaluation may have been due to the absence of peripheral ligament injury. However, the presence of residual tibial posteriorization suggests that the avulsion fracture of the PCL should be treated as bone-ligament injury, and not just as a bone lesion.

Keywords: Knee; Posterior cruciate ligament; Reconstruction; Bone fractures.
cases sex age (years) mechanism of injury injury on anterior leg surface associated injuries
01 fem 33 present ----- 2)
02 male 16 motorcycle no ----- 3
03 male 26 trampling no femoral fracture patellar fracture
04 male 17 auto present ----- 4
05 male 24 motorcycle present ----- 5
06 male 16 auto no ----- 6
07 male 15 motorcycle present ----- 7
08 male 20 motorcycle no ----- 8
09 male 31 motorcycle present ----- 9
10 male 29 car present leg fracture 10
11 male 23 motorcycle present ----- 11
12 male 32 motorcycle present ----- 12
13 fem 42 trampling no ----- 13
14 male 26 motorcycle no ----- 14
15 fem 39 trampling present ----- 15
16 fem 53 trampling no ----- 16
17 male 44 motorcycle present ----- 17
18 male 23 motorcycle present ----- 18
19 male 28 motorcycle present ----- 19
20 male 53 trampling present ----- 20
21 fem 35 car no ----- 21

Chart 1 - Descriptive data: sex, age (years), mechanism of injury, presence of injury on anterior leg surface, and associated injuries.

Figure 1 - Detail of skin incision adopted on posterior knee access port for the first 6 cases (A) and last 15 cases (B).

In 95% of the cases, the posterior draw test was not shown to be negative, evidencing a residual draw of + (0.5 cm) to ++ (1 cm). The results achieved in both evaluations - objective and subjective - were submitted to statistical analysis by Fisher's exact test.

RESULTS
Figures 4 and 5 show, respectively, the distribution of the number of cases according to age group and patient gender; the postoperative clinical evaluation by Lysholm scale and its correlation with posterior draw test at neutral position for the 21 study cases.

DISCUSSION
Knee’s posterior cruciate ligament (PCL) injuries account for about 20% of all knee ligament injuries, remaining prevalent among males and young adults. Torisu(8) assessed 21 patients with avulsion fracture of the tibial insertion of PCL, affecting males in 76% of the cases. Seitz et al.(10) in a retrospective study with 26 patients, reported 73% of male cases, with a mean age of 23 years. In this study, patients’ ages ranged from 15 to 53 years (mean = 29 years), and 76% were males.

the PCL bone fragment avulsed from its tibial bed were provided. (Figures 2-B and 2-C).
Bone fragment fixation was performed whenever possible with stiff synthesis (screws and washer), as shown by Figures 2-B and C. However, in one case where the bone fragment was too small, and in other 2 patients in whom the epiphyseal plate was open, trans-bone string fixation with Ethibond wire nr. 5 was employed (Figure 3-A and B).
In 91% of the cases, the procedure was performed within two weeks from injury. During surgical procedure, the average garrote use time was below 30 minutes. At postoperative follow-up, the operated limb was kept in a plastered cast or orthosis with the knee at neutral extension for 6 weeks, with partial load release being initiated at the end of the 3rd postoperative week. Then, a physical therapeutic rehabilitation program was established in order to gradually gain range of motion and muscle strengthening.
With a minimum follow-up time of 6-12 months, the patients were reassessed by means of the posterior draw test at neutral rotation, comparing the operated and control sides, Lysholm scale and simple X-ray test at AP and lateral planes.
Figure 2 - Illustration of (A) baseline X-ray image of bone avulsion of PCL’s tibial insertion at knee lateral plane, (B) posterior knee access and avulsed PCL fragment fixation, and (C) postoperative X-ray image of the avulsed fragment of the PCL in its tibial insertion with 3.5-mm cortical screw and washer at lateral knee plane.

Figure 3 - Schematic illustration of knee’s PCL bone fragment fixation in its tibial insertion performed with trans-bone string (A) and 3.5-mm cortical screw and washer (B).

Figure 4 - Distribution of the number of knee PCL avulsion fracture cases correlating patients’ gender in the four age groups (up to 20 years old, 20-30 years old, 30-40 years old and above 40 years old).

Figure 5 - Postoperative clinical evaluation by Lysholm scale (subjective) and its correlation with posterior draw test at neutral rotation (objective) in 21 knee’s PCL avulsion fracture cases.
The statistical analysis showed no significant differences at 5% level among evaluations. The absence of peripheral ligament injury may have contributed for postoperative clinical outcomes to have a satisfactory subjective rating; however, the presence of a residual tibial posteriorization suggests that posterior cruciate ligament avulsion fracture should be addressed not as a purely bone injury, but also as a bone-ligament injury.

CONCLUSIONS

1. Surgical treatment of avulsion fracture of the knee posterior cruciate ligament provides satisfactory outcomes according to subjective analysis (Lysholm).
2. Clinical outcomes achieved at the objective evaluation suggest that this injury should be interpreted not only as a purely bone injury, but also as a bone-ligament injury.

REFERENCES