Introduction:
Isolated bony PCL avulsion fractures are infrequent, estimated to account for 20% of knee ligament injuries. Anatomically PCL acts as a posterior knee stabilizer and limits the posterior tibial translation [1, 4, 5, 6]. The road traffic accidents (RTA), and sports injuries are common causes. The mode of trauma in PCL injuries is peculiar and comprises dashboard, hyperextension and hyper flexion injuries (1). Many studies [2, 3] have established that the chronic PCL insufficiencies lead to medial femoral and patellofemoral compartments, degenerative arthritis and increased risk of meniscal tears. Torisu et al [8] have quoted that PCL bony avulsion neglected beyond 11 weeks, have poor results. Griffith et al [9] strongly advocated fixation of displaced PCL avulsion fractures to avoid the morbidities associated with PCL avulsion fracture nonunion. Research advocate controversial treatment protocols in PCL tibial avulsion fractures but most studies advocate fixation of the avulsed fragment is an endorsed procedure [7, 8, 9, 10].

We centered our study explicitly on isolated bony PCL avulsion fractures so that we can preclude the compounding factors.

Methods:
This study included 15 patients (12 males and 3 females) with a median age of 28 years (range: 19-45 years) who underwent ORIF through Burks posterior approach for PCL avulsion fractures were studied after a median follow up of 18 months (range 12-42 months). All the patient included in the study had delayed presentation minimum 3 weeks after injury (3 weeks to 6 months). Patients were assessed using Lysholm questionnaire, physical examination and radiological examination. For the statistical analysis, a significance level of 0.10 and 95% confidence interval were used.

Results:
The results were fair or good in patients with open reduction and cancellous screw fixation of PCL avulsion injury with delayed presentation and these results were found to be statistically significant.

Conclusion:
The management of tibial chronic (delayed presentation) PCL avulsion fractures with the use of a cancellous lag screw and a washer by means of the posterior Burks approach leads to satisfactory clinical, radiographic, and functional results.

Keywords: PCL avulsion, Screw fixation, Delayed presentation

Purpose:
The most efficient treatment of chronic posterior cruciate ligament (PCL) avulsion is still debatable. The study was aimed at management of posterior cruciate ligament (PCL) avulsion fractures with delayed presentation more than 3 weeks with open reduction and internal fixation (ORIF). This study also evaluated the effect of delay in treatment and presence of occult PCL injury on the final outcome after surgery.

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At follow up, the standard X-rays were done and the Lysholm and IKDC score was evaluated up to 8 months, 12 months and 24 months post surgery

Clinical
1. Lysholm score.
2. IKDC score

Radiological Status:
1. Union status
2. Position of screw

Assessment Criteria
All patients were reviewed in OPD clinic and radiographs were obtained immediately post operatively and then at 6 weeks, three months, 12 months and 24 months. From 3 months onwards symptoms and functions were assessed using the scoring system of Lysholm and IKDC score.

Results:
1) Age wise distribution
- Patients were of age group between 19-45 years.
- Median age 28 years (range: 19-55 years)

2) Sex distribution
- The males were 80% (12 out of 15) as compared to the females who amounted to 20% in this study.
- There was definite male preponderance.
- The reason for male dominance is due to the road traffic accidents and injuries in sports. The domestic falls were common among females.

3) Mode Of Injury
- 60% had dashboard injuries, and 26.67% had hyperextension and 13.33% had hyper-flexion injury.
- Road traffic accident dashboard type was the main cause to produce PCL avulsion fractures in our study.
- Other cause is fall from hyperextension 4 or hyper-flexion 2 involving either of trauma due to vehicular accident, sports or domestic injury.

4) Comparison of IKDC, Lysholm scores preoperatively and post operatively.

<table>
<thead>
<tr>
<th>LYSHOLM SCORE</th>
<th>IKDC SCORE</th>
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</thead>
<tbody>
<tr>
<td>PRE-OP</td>
<td>POST-OP</td>
</tr>
<tr>
<td>23.44</td>
<td>84.7</td>
</tr>
</tbody>
</table>

4) Preoperative and Postoperative posterior drawers tests. in the 15 cases
- Preoperative testing showed that all three groups had posterior sag and the drawer test was positive either in grade 1, 2 or 3.
- None of PCL avulsion fractures had normal anterior tibial offset.

Table 1: Time for fracture union.
- Majority 12 out of 15 of the fracture united radiologically within 12 weeks.
- 3 out of 15 of cases developed delayed union although when followed up to 20 weeks showed radiological union without any further intervention.

<table>
<thead>
<tr>
<th>TIME</th>
<th>NO. OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 TO 12 WEEKS</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>12 TO 16 WEEKS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16 TO 20 WEEKS</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>
There were 2 cases of restricted full flexion with difficulty in deep squatting movement.

There was 1 case with superficial skin stitch infection both of which healed uneventfully after minor debridement.

**Discussion:** In our study most patients were of age group between 19-45 years with median age 28 years (range: 19-45 years). The males were 80% (12 out of 15) as compared to the females who amounted to 20% in the study.

Seitz et al in his retrospective study of 26 patients reported mean age of 23 years and 73% males (13). Torisu et al had 76% males in his study of 21 patients with PCL tibial avulsion fractures (8). R Piedad et al in 2007 reported ages from 15 to 53 years with a mean of 29 years also having predominantly males (76%) (14). There was definite male preponderance. The reason behind male dominance is obvious due to the road traffic accidents and involvement in sports.

The mechanism of injury was 60% had dashboard injuries, and 26.67% had hyperextension and 13.33% had hyperflexion injury. As compared to our study, Torisu et al (8) in his study of 36 patients found 47% anterior tibial injury suggesting of dashboard type whereas in the retrospective study (13) by Seitz et al found 87% to be dashboard type with all these patients having pretrial ecchymosis. (14) In R Piedad et al 2007 case series, 57% of the injuries were resultant from motorcycle accidents, and 17% have been caused by car accidents, while the presence of injury on the anterior leg surface was found in 62% of the cases.

There are few studies of delayed presentations of PCL avulsion fractures (7,8,10,15, 16). Surgical repair after 3 weeks is not considered to be worthwhile in some studies (17,18). However, delayed presentation does not necessarily contraindicate open reduction and internal fixation, which achieves best clinical outcome for acute cases (<3 weeks) (19). The posterior burks approach is commonly used despite technical difficulties (7,8,10). Fixation with a lag screw, staple, or suture achieves good outcome in acute cases (7,10).

15 cases of delayed presentations (> 3 weeks) of PCL avulsion fractures were repaired surgically and achieved complete resolution of symptoms, although 2 of them had residual anteroposterior instability.

Two of our patients had residual anteroposterior instability of 4 to 5 mm, but had good to fair functional outcome at the final follow-up. Their preoperative magnetic resonance images showed abnomral density in the PCL substance, probably owing to strain of the PCL fibres or partial tear.

Nonetheless, in one study 10 patients achieved good to excellent functional outcome after lag screw fixation despite residual anteroposterior instability (mean laxity, 2.4 mm), and their mean Lysholm score was 91 (20).

In another study, 3 patients had a laxity of 3 to 4 mm, but their functional outcome was good, with the time to union being 7 to 9 weeks (15). The healing time and functional outcome were similar to our series.

**REFERENCES**