Platelet-Rich Plasma Does Not Decrease Blood Loss in Total Knee Arthroplasty

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abstract

This study was designed to assess the use of platelet-rich plasma (PRP) during primary total knee arthroplasty (TKA). The authors hypothesized that this would result in less blood loss and greater hemoglobin and hematocrit levels at discharge and would potentially decrease the length of hospital stay. Leukocyte rich PRP was used during the procedure and at wound closure. Two surgeons performed all procedures in a similar fashion. Two different TKA implants were used. Each surgeon used the same implant throughout the study. A limited medial parapatellar approach was used and drains were used at closure. No tranexamic acid preparations were used. Continuous passive motion machines were used in all patients during their hospital stay. A total of 102 consecutive TKAs were performed. The study group (n=46) consecutively received the PRP injections during the TKA, whereas the control group (n=47) did not. Hemoglobin and hematocrit levels were obtained pre- and postoperatively. Estimated blood loss was recorded during surgery, and the auto-collection reinfusion drain system output was measured. The length of hospital stay was collected and recorded. The study showed that hemoglobin and hematocrit levels were not different when comparing study and control groups. Age and sex differences were insignificant. Finally, no statistical difference was seen for the estimated blood loss and hospital stay between the 2 groups. Platelet-rich plasma use during TKA does not decrease hospital stay or reduce estimated blood loss in the perioperative period. [Orthopedics. 2015; 38(5):e434-e436.]

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The use of platelet-rich plasma (PRP) has become increasingly more common throughout many aspects of orthopedics. Some reports suggest that PRP may have beneficial effects in total knee arthroplasty (TKA).1,2

The past decade has seen an increase in the use of PRP in orthopedics. Platelet rich plasma was initially used in maxillofacial surgery and plastic surgery in the 1980s and is currently used in an attempt to augment the healing response in a variety of tissues.3 Defined as a sample of autologous blood with concentrations of platelets above baseline values, PRP has been used in orthopedics to treat bone defects, fracture nonunion, osseous defects, laminectomy, spinal fusion, and a variety of acute and chronic soft tissue pathologies.4-9 Like many areas of medicine, the role of PRP in arthroplasty has yet to be defined.10 Several studies suggest that the use of PRP can reduce hemoglobin loss after TKA.11-13 This study addresses the use of PRP in TKA and its potential effects on blood loss.

MATERIALS AND METHODS

The study was conducted using a prospective observational study design. Ninety-three patients diagnosed with osteoarthritis of the knee were scheduled for a primary unilateral TKA. Patients were operated on consecutively. All surgeries were performed using a standard surgical procedure while under standard spinal anesthesia and a postoperative femoral nerve block by 2 surgeons (E.M.T., C.A.J.) using the same pre- and postoperative protocol. Tranexamic acid was not used. The study was approved by institutional review board, and all study patients were informed about the PRP injection protocol. Written informed consent was obtained from all participants. The control group consisted of 47 patients who were operated on without the use of the PRP injection. The study group consisted of 46 patients who received the PRP injections. The SmartPreP 2 APC-Plus system (Harvest Technologies, Lakewood, Colorado) was used for preparation of the samples.

The PRP injections were obtained from Advanced Transfusion Services, Inc. The samples used were those of the SmartPreP 2 APC-Plus. A total of 60 mL of autogenous venous blood was used from each patient. Approximately 6 mL of PRP was separated as the buffy coat; therefore, this was not a leukocyte-poor product. Calcium chloride and thrombin activator were used. The platelet poor plasma was used on the wound after skin closure.

Standard medial parapatellar approaches with cruciate substituting implants were used. A one-eighth–inch hemovac unit was connected to an auto-collection unit, which was discontinued after 24 hours. Postoperative reinfusion and drain outputs were recorded. Daily hemoglobin levels and length of hospital stay were recorded.

RESULTS

Study data were recorded and entered into a computerized database. Statistical analysis was completed using SAS version 9.2 statistical software (SAS Institute Inc, Cary, North Carolina). Categorical data were expressed as percentages, with 93 patients included. No significant differences were found in the control and treatment groups in age and sex. Statistical analysis showed that PRP injections did not have a significant effect on estimated blood loss during surgery \((P=.686)\). Drain output was also not significantly different between groups \((P=.14)\). Postoperative hemoglobin levels were unaffected by PRP injections \((P=.345)\) but were largely based on preoperative hemoglobin level \((P=.010)\). Age and sex played significant roles in the length of hospital stay. Older patients were more likely to have longer hospital stays \((P=.013)\) than the younger patients, and women \((P=.005)\) were more likely to have longer stays than men (Table). These results were independent of patients who received the PRP injections. No infections were observed in either group at 1 year.

Transfusion rates were also not different between control and treatment groups \((P=.369)\). Therefore, the application of PRP did not significantly increase or decrease a patient’s hospital stay, estimated blood loss, or postoperative hemoglobin levels.

A cost analysis revealed a $2564 cost difference to the patient for the PRP treatment.

DISCUSSION

The perceived relative safety and ease of administration has made PRP an attractive option for many musculoskeletal conditions.6,14-19 Ongoing efforts to reduce blood loss after TKA have stimulated many to try PRP as a means to improve hemostasis.1,2,11-13 Attempts to standardize PRP aggregates are ongoing but are still imperfect and incompletely understood.4,12,20 The role of leukocyte poor solutions has been debated as well, with some data suggesting that the inflammatory response seen with leukocyte rich solutions may delay healing.21 Currently, clinical trials have been inconclusive on the benefits of PRP in many areas of orthopedics, not just arthroplasty. Several authors

### Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, No.</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>Age, average, y</td>
<td>64.7</td>
<td>67.1</td>
</tr>
<tr>
<td>Sex, female/male, No.</td>
<td>19/27</td>
<td>28/19</td>
</tr>
<tr>
<td>EBL, average, mL</td>
<td>110</td>
<td>117.4</td>
</tr>
<tr>
<td>Hemoglobin, average, g/dL</td>
<td>14</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Abbreviation: EBL, estimated blood loss.
have suggested that the only consistently positive data have been for the treatment of lateral epicondylosis.\textsuperscript{10,17,22} The consistent approach, pooling data from 2 surgeons, and standardized perioperative protocol were strengths of the study. This study was limited by its small size and an inability to blind those involved. It did not assess pain or range of motion in the postoperative period. Thus, this study was able to address only a few variables.

**Conclusion**

In this prospective observational study, patients who had a TKA treated with PRP did not have less blood loss or shortened hospital stays compared with matched controls. A larger prospective, randomized, blinded trial could more fully determine the efficacy of PRP in the patients undergoing TKA.

**References**


