



# Minimizing blood transfusions in total shoulder arthroplasty

David A. Barcel, Richard J. Friedman

Department of Orthopaedics, Medical University of South Carolina, Charleston, SC, USA

Correspondence to: Richard J. Friedman, MD, FRCSC. Department of Orthopaedics, Medical University of South Carolina, 96 Jonathan Lucas Street, CSB 708, Charleston, SC 29425, USA. Email: [friedman@musc.edu](mailto:friedman@musc.edu).

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Over the past decade and a half the incidence of total shoulder arthroplasty (TSA) has increased by as much as 9.4% annually (1) and in 2011, an estimated 66,485 were performed (2). TSA is a major surgery, with the risk of significant blood loss. Complications associated with allogeneic blood transfusion have been well established and include immunologic reaction, infection, cardiopulmonary complications and death. A recent study demonstrated a significantly higher risk of postoperative wound and respiratory infections in those who underwent total hip arthroplasty (THA) or total knee arthroplasty (TKA) and received postoperative blood transfusions (3). Furthermore, allogeneic blood transfusion is costly. If all hospital expenditures are considered, total costs may exceed \$1,000 for each unit of blood transfused (4).

In the paper by Padegimas *et al.*, it was demonstrated that patients with a preoperative hematocrit (Hct) of 39.6% or lower have a significantly increased risk of allogeneic blood transfusion after TSA (5). Those with preoperative Hct <39.6% were transfused 11% of the time compared with only 0.7% for patients with Hct >39.6%. This is similar to the findings of Cushner and Friedman which showed that preoperative Hct was an even greater predictor of transfusion than intra-operative blood loss in TKA and THA (6). This new evidence could prove useful when evaluating shoulder arthroplasty candidates at the preoperative clinic visit to help identify patients who are at risk for postoperative blood transfusion.

Previous strategies to limit postoperative blood transfusions in THA and TKA have included preoperative erythropoietin, preoperative autologous donation and postoperative transfusion, intra-operative blood salvage,

and postoperative reinfusion, but they failed to result in a substantial decrease in the transfusion rate. Another recent option to minimize the risk of a postoperative blood transfusion is the administration of tranexamic acid (TXA) in TSA. It is well established that the use of TXA in THA and TKA reduces blood loss, decreases transfusion rates, prevents wound hematoma and is associated with shorter operative times (7-9). Recent studies have demonstrated benefits in TSA comparing those who received perioperative TXA to those who did not, with significantly shorter hospital stays, less blood loss with decreased change in hemoglobin (Hgb) and Hct, and a significant reduction in perioperative blood loss (10-12).

Patients in the current study typically underwent blood transfusion for a Hgb level of “less than 7.5 g/dL if asymptomatic and less than 9.0 g/dL with a significant cardiac history or with symptoms of dizziness or light-headedness (5).” The American Academy of Blood Banks (AABB) has since published new guidelines for the administration of blood (13). They recommend transfusion in otherwise healthy, hospitalized but stable patients when Hgb levels reach 7 g/dL or less, or when levels reach 8 g/dL or less in patients with pre-existing cardiovascular disease and/or when levels reach 8 g/dL or less in patients with symptoms. These new guidelines suggest a lower threshold of Hgb for the administration of blood than those utilized in the current study. Although they report lower transfusion rates in TSA than previously documented in the literature, it is likely that the incidence of transfusion would be even lower under these new guidelines.

The authors of this study have identified an important tool for risk assessment in patients undergoing elective

TSA. Moving forward, this study provides information that perhaps not all patients would receive the same benefit from the administration of TXA in the perioperative period. Complex primary TSA secondary to trauma, such as mal-united fractures, and revision TSA, for example, may benefit more from the administration of TXA. For patients with a preoperative Hct <39.6%, the use of TXA and adherence to the most recent transfusion guidelines can help reduce the risk of transfusion even further. Further studies comparing the benefits of TXA in TSA in other high risk groups, in addition to those with a preoperative Hct <39.6%, would be beneficial to the care of our patients.

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### References

- Day JS, Lau E, Ong KL, et al. Prevalence and projections of total shoulder and elbow arthroplasty in the United States to 2015. *J Shoulder Elbow Surg* 2010;19:1115-20.
- Jain NB, Yamaguchi K. The contribution of reverse shoulder arthroplasty to utilization of primary shoulder arthroplasty. *J Shoulder Elbow Surg* 2014;23:1905-12.
- Friedman R, Homering M, Holberg G, et al. Allogeneic blood transfusions and postoperative infections after total hip or knee arthroplasty. *J Bone Joint Surg Am* 2014;96:272-8.
- Blumberg N, Kirkley SA, Heal JM. A cost analysis of autologous and allogeneic transfusions in hip-replacement surgery. *Am J Surg* 1996;171:324-30.
- Padegimas EM, Clyde CT, Zmistowski BM, et al. Risk factors for blood transfusion after shoulder arthroplasty. *Bone Joint J* 2016;98-B:224-8.
- Cushner FD, Friedman RJ. Blood loss in total knee arthroplasty. *Clin Orthop Relat Res* 1991;(269):98-101.
- Irissou E, Hémon Y, Pauly V, et al. Tranexamic acid reduces blood loss and financial cost in primary total hip and knee replacement surgery. *Orthop Traumatol Surg Res* 2012;98:477-83.
- Huang F, Wu D, Ma G, et al. The use of tranexamic acid to reduce blood loss and transfusion in major orthopedic surgery: a meta-analysis. *J Surg Res* 2014;186:318-27.
- Zhang H, Chen J, Chen F, et al. The effect of tranexamic acid on blood loss and use of blood products in total knee arthroplasty: a meta-analysis. *Knee Surg Sports Traumatol Arthrosc* 2012;20:1742-52.
- Friedman RJ, Gordon E, Butler RB, et al. Tranexamic acid decreases blood loss after total shoulder arthroplasty. *J Shoulder Elbow Surg* 2016;25:614-8.
- Abildgaard JT, McLemore R, Hattrup SJ. Tranexamic acid decreases blood loss in total shoulder arthroplasty and reverse total shoulder arthroplasty. *J Shoulder Elbow Surg* 2016. [Epub ahead of print].
- Gillespie R, Shishani Y, Joseph S, et al. Neer Award 2015: A randomized, prospective evaluation on the effectiveness of tranexamic acid in reducing blood loss after total shoulder arthroplasty. *J Shoulder Elbow Surg* 2015;24:1679-84.
- Carson JL, Grossman BJ, Kleinman S, et al. Red blood cell transfusion: a clinical practice guideline from the AABB\*. *Ann Intern Med* 2012;157:49-58.

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