Blood Conservation

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Published online in Wiley Online Library (wileyonlinelibrary.com). DOI 10.1002/jor.22551

 J Orthop Res 32:S81–S89, 2014.

Question 1: Is blood transfusion associated with an increased risk of surgical site infection (SSI)/ periprosthetic joint infection (PJI)?

Consensus

Yes. Allogeneic blood transfusions is associated with an increased risk of SSI/PJI. The role of autologous transfusion in the risk of SSI/PJI remains inconclusive.

Delegate Vote

Agree: 91%, Disagree: 5%, Abstain: 4% (Strong Consensus)

Justification

Based on the Centers for Disease Control and Prevention (CDC) guideline, perioperative allogeneic blood transfusion in arthroplasty increases the risk of SSI/PJI. The association between autologous blood transfusion and the risk of SSI/PJI is less clear.

According to high-quality evidence from two randomized controlled trials (RCTs) and four observational studies, there is an increased risk of SSI with any blood transfusion (allogeneic, autologous, and autologous plus allogeneic blood transfusion data combined) as compared to no transfusion. This is further supported by both a meta-analysis of six studies ($n = 8{,}493$) [odds ratio (OR): 1.56; 95% confidence interval (CI): 1.18–2.06; $p = 0.002$] and a meta-analysis ($n = 7{,}484$) of 4 observational studies (OR 1.59; 95% CI: 1.15–2.18; $p = 0.004$).[1]

Data from a meta-analysis ($n = 970$) of two RCTs in hip arthroplasty suggests that autologous blood transfusion is not associated with an increased risk of SSI when compared to no blood transfusion (OR: 1.15, 95% CI: 0.43–3.13; $p = 0.78$).[1]

Low-quality evidence from a meta-analysis ($n = 5{,}737$) of four observational studies indicates that allogeneic blood transfusion is associated with an increased risk of SSI (non-adjusted OR: 1.46, 95% CI: 1.09–1.95, $p = 0.01$).[1]

Evidence from a meta-analysis ($n = 2{,}592$) of three observational studies shows that transfusion with allogeneic blood increases the risk of SSI as compared to transfusion with autologous blood (OR: 4.57, 95% CI: 2.39–8.73, $p < 0.0001$).[1] The study by Innerhofer et al.[2] demonstrated a clear increased risk for allogeneic blood over autogenous blood (high overall infection risk in this study). White cell depletion does not appear to affect the infection rate with autologous blood in hip surgery.[3]

Evidence from one RCT and two observational studies indicates no increased risk of SSI in patients who receive both autologous and allogeneic blood transfusions.[1]

Question 2: What are the predictors of the need for allogeneic blood transfusion in patients undergoing surgery for TJA?

Consensus

A lower preoperative hemoglobin level is the strongest predictor for the potential need for allogeneic transfusion after TJA. The use of general anesthesia, higher Charlson comorbidity index, female gender, and longer duration of surgery are predictors of the potential need for allogeneic blood transfusion in patients undergoing total joint arthroplasty (TJA).

Delegate Vote

Agree: 90%, Disagree: 4%, Abstain: 6% (Strong Consensus)

Justification

The above-mentioned factors have been described as predictors of allogeneic blood transfusion in patients undergoing primary TJA. However, in these studies various transfusion triggers have been utilized, with a lower transfusion rate seen when a lower predefined Hgb level is used (currently 7–8 g/dl). Currently the most optimal hemoglobin threshold for transfusion remains unknown. The only prospective randomized controlled trial in orthopedics is the FOCUS trial,[4] which found no outcome differences with transfusing above or below 8 g/dl. The results of this trial were similar to those found in the TRICC trial.[5] There are also many studies emphasizing the effect of operative time on perioperative blood loss and transfusion rate.[6–17]

In a single-institute study of 11,373 TJAs, including 4,769 total knee arthroplastyies (TKAs) and 6,604

total hip arthroplasties (THAs), multivariate analysis indicated that male gender (263.59 and 233.60 ml in hips and knees), Charlson comorbidity index of >3 (293.99 and 167.96 ml in hips and knees, respectively), and preoperative autologous blood donation (593.51 mL in hips and 592.30 in knees) increase the amount of blood loss.[18] Regional anesthesia compared to general anesthesia reduced the amount of blood loss. Amount of blood loss in both THA (OR: 1.43, 95% CI: 1.40–1.46) and TKA (OR: 1.47, 95% CI: 1.42–1.51) and Charlson comorbidity index-only in TKA patients (OR: 3.2, 95% CI: 1.99–5.15) increased risk of allogeneic blood transfusion. Preoperative autologous blood donation (OR: 0.01, 95% CI: 0.01–0.02 in hips and 0.02, 95% CI: 0.01–0.03 in knees) decreased the risk of allogeneic blood transfusion.

In a study by Faris et al.[19] the predictive power of seven preoperative variables (hemoglobin concentration, age, erythropoietin level, ferritin concentration, serum iron, total iron-binding capacity, and predicted blood volume) on the risk of transfusion in orthopedic patients was tested in 276 surgical cases. The authors found that baseline hemoglobin concentration and predicted blood volume were significant predicators of transfusion risk. They also found an inverse correlation between hemoglobin concentration and transfusion risk. Placebo-treated patients with hemoglobin >10 to ≤13 g/dl had an approximately two times greater risk of transfusion than patients with hemoglobin >13 g/dl.

The study by Perazzo et al.[20] also confirmed that the preoperative hemoglobin level was a strong predictor of need for blood transfusion following TJA. They assessed the association between preoperative autologous blood donation and risk of transfusion in 600 TJA patients, including 312 THAs and 288 TKAs. The authors suggested that a pre-operative autologous donation may not be necessary. Their data also suggested that the use of a cell salvage system may be effective in reducing the blood transfusion rate.

The study by Hamaji et al.[21] indicated that preoperative fluid loading can reduce the transfusion requirement and possibly infection rate; however, it was a small study with a high infection rate. Colloid may be preferable over crystalloid[22] and neither method has a significant effect on clotting in vitro.[23]

Question 3A: What is the role of the type of anesthesia in minimizing blood loss and allogeneic blood transfusion during arthroplasty surgery for PJI?

Consensus

Compared to general anesthesia, neuraxial anesthesia reduces the amount of blood loss during TKA or THA.

Delegate Vote

Agree: 77%, Disagree: 11%, Abstain: 12% (Strong Consensus)

Question 3B: Is there evidence against neuraxial blockade in PJI cases (due to probable risk of spreading infection)?

Consensus

No. The decision to use neuraxial versus general anesthesia in patients with PJI lies with the anesthesia team and needs to take into account the numerous benefits of neuraxial anesthesia versus the potential for development of infectious central nervous system complications (arachnoiditis, meningitis, and abscess) with the use of anesthesia.

Delegate Vote

Agree: 83%, Disagree: 6%, Abstain: 11% (Strong Consensus)

Justification

Several systematic reviews and meta-analyses[24–28] compared neuraxial with general anesthesia regarding the amount of blood loss and blood transfusion during TJA. All these reviews support the role of neuraxial anesthesia in reducing amount of blood loss and transfusion requirements.

A meta-analysis by Hu et al.[25] of 21 RCTs published from 1966 to April 2008 was performed to study the relationship between type of anesthesia and transfusion requirement. Pooled results from these trials showed that neuraxial anesthesia reduces the operating time (OR: −0.19; 95% CI: −0.33 to −0.05) and transfusion requirement (OR 0.45; 95% CI: 0.22–0.94) compared with general anesthesia. Furthermore, a systematic review of 18 studies published from January 1990 to October 2008 involving 1,239 THA patients showed that blood loss may be reduced in patients receiving neuraxial anesthesia compared to general anesthesia.[26] Another systematic review of articles published up until 2004 showed that neuraxial anesthesia reduced the number of transfused THA patients ($p = 0.0009$).[24] The authors concluded that neuraxial blocks have a clear and definite effect on surgical blood loss and result in a reduction in the number of transfused patients. A meta-analysis of 10 clinical trials whose results were published up until August 2005, including 330 THA patients under general anesthesia and 348 patients under neuraxial block, indicated that neuraxial block decreases total operative time by 7.1 min/case (95% CI: 2.3–11.9 min) and intraoperative blood loss by 275 ml/case (95% CI: 180–371 ml).[28] Another study by Stundner et al.[29] demonstrated that neuraxial anesthesia versus general anesthesia significantly reduced overall complications, including the transfusion requirement. Lastly, using a large database, Memtsoudis et al.[30] demonstrated that the need for blood transfusion was reduced with neuraxial versus general anesthesia.

On the contrary, a systematic review of 28 studies published from January 1990 to October 2008 involv-

ing 1,538 TKA patients failed to find any evidence supporting a lower amount of blood loss or blood transfusion for patients receiving regional compared to general anesthesia.[27]

A meta-analysis of 17 RCTs about various orthopedic surgeries including TJA indicated that induced hypotension can reduce blood loss by approximately 287 ml of [95% CI: −447 to −127] during the orthopedic surgeries.[31] Moreover, a statistically significant reduction in the transfusion rate was also observed in the same cohort (−667 ml of blood transfused; 95% CI: −963 to −370). No statistically significant differences were found regarding operative time and improve surgical condition.

There is ample evidence to suggest that regional anesthesia can be performed safely if antibiotic treatment of the infection has started prior to the placement of the regional block.[32] It appears that serious central nervous system infections such as arachnoiditis, meningitis, and abscess are rare after neuroaxial anesthesia. Thus, an individualized decision must be made for performing neuroaxial block in cases with infection. The anesthetic alternatives, advantages of neuroaxial block, and risk of central nervous system infection, which theoretically may develop in the case of bacteremia, should be taken into account in making this decision. There is a paucity of literature that studies the risk of epidural abscess in patients undergoing surgery for PJI under regional anesthesia. In a recent study, Gritsenko et al.[33] suggested that the risk of the central nervous system after neuraxial block during the removal of infected hip/knee implants is very small and that neuraxial anesthetics be used more liberally in this setting if there are no systemic signs of infection. They also recommended that no epidural catheters remain in place after the procedure. It appears that multiple neuroaxial blocks within a short time period may be a risk factor for development of epidural abscess in patients with underlying PJI.

If neuroaxial anesthesia is employed in patients undergoing treatment for PJI, every effort should be made to remove the epidural catheter soon after surgery. If a central nervous system infection occurs, prompt diagnosis and treatment of infection must be performed to avoid neurologic sequelae.

The study by Chang et al.[34] found that the infection risk was 2.2 times lower with spinal anesthesia versus general anesthesia.

Question 4A: What is the role for adjuvant technologies including cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution for minimizing blood loss during surgery for PJI?

Consensus

There is no defined benefit for the use of cell salvage systems, reinfusion drains, biopolar sealers, and hemodilution for management of PJI.

Delegate Vote

Agree: 85%, Disagree: 8%, Abstain: 7% (Strong Consensus)

Question 4B: What is the role for adjuvant technologies including cell salvage systems, reinfusion drains, bipolar sealers, and hemodilution for minimizing blood loss during TJA?

Consensus

There is no defined benefit for the use of cell salvage systems, reinfusion drains, biopolar sealers, and hemodilution during primary, unilateral TJA.

Delegate Vote

Agree: 80%, Disagree: 11%, Abstain: 9% (Strong Consensus)

Justification

The role of cell salvage in reducing transfusion rates is unclear; however, it appears that cell salvage can be used in infected cases. Leukocyte depletion filters can be used to filter any salvaged blood. These filters are effective at removing white blood cell counts (WBCs) and bacterial loads up to 10^4 CFU/ml. Any residual bacteria would be treated by perioperative antibiotics in the same way as any bacteremia that occurs during the surgery.[35] The use of bipolar sealers has been associated with mixed results in primary TJA. In a double-blind RCT, 71 and 69 THA patients were assigned to either a bipolar sealer or a control arm group (conventional electrocautery), respectively.[36] The authors did not find any significant differences between the two groups regarding either the amount of blood loss or transfusion rate. Based on these findings, the authors discontinued the use of bipolar sealer for THA patients. In another prospective RCT of 105 patients undergoing primary THA, Zeh et al.[37] found that there was no statistically significant difference between total intraoperative and postoperative blood loss between the bipolar sealer and conventional electrocautery group.

On the contrary, a case-matched study showed that use of bipolar sealer may be effective in reducing the amount of blood loss and hemoglobin drop in patients undergoing revision THA for infection.[38] In a case-matched study of 76 consecutive revision THAs for infection, a bipolar sealing group was compared with conventional electrocautery.[38] The results of this study showed that total blood loss, intraoperative blood loss, and perioperative hemoglobin drop were significantly less in the bipolar sealer group. Furthermore, in a prospective, blinded, randomized study, 50 primary THA were assigned to two groups: bipolar sealer and standard electrocautery.[39] The results of this study revealed that the total blood loss in the bipolar sealer group decreased by 40% and the transfusion rate was reduced by 73%. There was a significant reduction in intra- and postoperative blood loss. Similarly,

Marulanda et al.[40] showed that the bipolar sealer can reduce the amount of blood loss in TKA.

Question 5A: Does the use of a drain(s) influence the incidence of SSI/PJI?

Consensus
No. There is no evidence to demonstrate that the use of closed drains increases the risk of SSI/PJI following TJA.

Delegate Vote
Agree: 88%, Disagree: 8%, Abstain: 4% (Strong Consensus)

Question 5B: When should drain(s) be removed?

Consensus
There is no conclusive evidence for the optimal timing of drain removal.

Delegate Vote
Agree: 68%, Disagree: 22%, Abstain: 10% (Strong Consensus)

Justification
Based on a systematic review and a meta-analysis,[41,42] the use of a drain following TJA increases the transfusion rate but there is no increased risk for developing SSI. Studies have indicated that about 90% of postoperative bleeding is collected by the drain within the first 24 postoperative hours. By considering the probable increase in the risk of bacterial colonization due to the drain after 24 h,[43] it is recommended that drains be removed within 24 h after routine elective arthroplasty. In select circumstances, the treating surgeon may decide to retain the drain in the operated joint for a longer period of time.

In a Cochrane systematic review, all randomized or quasi-RCTs comparing the use of closed suction drainage systems with no drainage systems for all types of elective and emergency orthopedic surgery were evaluated.[41] Thirty-six studies involving 5,464 participants with 5,697 surgical wounds were included. Various types of orthopedic surgeries, including THA and TKA, were evaluated in this systematic review. Pooling the results of these trials indicated no statistically significant difference in the incidence of wound infection, hematoma, dehiscence, or re-operations between patients in whom a drain was inserted and those without a drain. Blood transfusion was required more frequently in those with drains. The need for reinforcement of wound dressings and the occurrence of bruising were more common in the group without drains. The Cochrane study thus concluded that there is insufficient evidence to support the routine use of closed suction drainage in orthopedic surgery.

In a meta-analysis by Parker et al.[42] 18 studies on elective THA and TKA including 3,495 patients with 3,689 wounds were evaluated. The results of this systematic review indicated that closed suction drainage increases the transfusion requirements after elective THA and TKA and has no major benefits.

Question 6A: What is the role for tranexamic acid (TA) for minimizing blood loss during surgery for treatment of PJI?

Consensus
Administration of both intravenous and topical TA reduces the amount of blood loss and allogeneic blood transfusion in TJA.

Delegate Vote
Agree: 82%, Disagree: 5%, Abstain: 13% (Strong Consensus)

Question 6B: Does administration of topical TA have an advantage over intravenous (IV) administration?

Consensus
Topical TA does not have any obvious advantage over IV administration of the drug and both are safe. However, topical TA may be used in certain group of patients in whom IV TA is considered to be inappropriate.

Delegate Vote
Agree: 76%, Disagree: 4%, Abstain: 20% (Strong Consensus)

Justification
Based on seven available systematic reviews and meta-analyses,[44–50] administration of TA reduces the amount of blood loss and blood transfusion in THA and TKA patients. It can be concluded that administration of TA is safe and effective in reducing the amount of blood loss and allogeneic blood transfusion in revision TJA, including surgeries for treatment of PJI. There has been no study to demonstrate that use of either topical or intravenous TA results in a higher incidence of thromboembolic episodes. In fact the Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage trial (CRASH) found that TA may be protective against thrombotic complications.[51–53]

A systematic review and meta-analysis by Alshryda et al.[44] evaluated 19 placebo-controlled RCTs. Eighteen of these studied the IV administration of TA, one study evaluated oral administration,[54] another examined topical application of TA,[55] and one compared TA with normovolemic hemodilution.[56] Three RCTs evaluated the effect of high doses (>4 g) of TA[54,57,58] and others evaluated the effect of low-dose TA.[59–65] The systematic review and meta-analysis found that TA causes a significant reduction in the rate of blood transfusion (risk ratio (RR): 2.56, 95% CI: 2.1–3.1, $p < 0.001$; heterogeneity $I^2 = 75\%$) and total blood loss by a mean of 591 ml (95% CI: 536 to 647, $p < 0.001$; $I^2 = 78\%$). A subgroup analysis of high-dose TA indicat-

ed a reduction in blood transfusion (RR 5.33; 95% CI: 2.44 to 11.65, $p < 0.001$; $I^2 = 0\%$). This systematic review and meta-analysis did not find any evidence that supported an increase in the risk of either deep-vein thrombosis or pulmonary embolism following administration of TA in TKA patients.

A systematic review and meta-analysis by Sukeik et al.[49] evaluated the effect of administration of TA in THA patients. Eleven RCTs [66–76] were included in the meta-analysis. The authors showed that use of TA reduces intraoperative blood loss by a mean of 104 ml (95% CI: −164 to −44, $p = 0.0006$, I^2:0%), postoperative blood loss by a mean of 172 ml (95% CI: −263 to −81, $p = 0.0002$, I^2:63%), and total blood loss by a mean of 289 ml (95% CI: −440 to −138, $p < 0.0002$, I^2:54%). TA resulted in a significant reduction in the allogeneic blood transfusion rate (risk difference: −0.20, 95% CI: −0.29 to −0.11, $p < 0.00001$, I^2:15%). No significant differences were observed in the rate of deep vein thrombosis, pulmonary embolism, infection rates, or other complications among the study groups.

Administration of TA is effective to further reduce the amount of perioperative blood loss following TKA. In an RCT of 151 patients, Lin et al.[77] randomly assigned patients who underwent unilateral TKA to one of three groups: (1) a placebo group (50 patients); (2) a one-dose TA group (52 patients), who received one injection of TA (10 mg/kg) intra-operatively on deflation of the tourniquet; and (3) a two-dose TA group (49 patients), who received two injections of TA (10 mg/kg) given pre-operatively and intra-operatively. They demonstrated that one intra-operative dose of TA was as effective as two doses for blood conservation during TKA.

In a study by Aguilera et al.[78] the effect of TA in reducing blood loss and blood transfusion in revision TKA was evaluated. In this study, patients who received TA had a significantly lower amount of blood loss ($p = 0.015$); however, the rate of transfusion was not statistically lower in the TA group ($p = 0.057$). No adverse events were observed in the studied patients.

In an RCT of 98 adult patients undergoing THA or TKA, Oremus et al.[79] showed that adding TA to a restrictive transfusion protocol in patients undergoing TJA makes the use of a postoperative blood salvage system unnecessary.

Question 7: What is the role for other agents such as platelet-rich plasma (PRP), fibrin glue for minimizing blood loss?

Consensus

The routine use of PRP is not recommended. There is some evidence that fibrin products may reduce blood loss.

Delegate Vote

Agree: 91%, Disagree: 1%, Abstain: 8% (Strong Consensus)

Justification

There are several RCTs supporting the efficacy of fibrin products in reducing the amount of blood loss and transfusion requirements in TJA patients. However, the results of studies on PRP are mixed and it is difficult to draw a definite conclusion.

In the study by Diiorio et al.[80] 134 TKA patients who received PRP were retrospectively evaluated. The authors failed to show a statistically significant difference regarding the amount of blood loss between patients who received PRP and those who did not.

In a retrospective study of 98 unilateral TKAs (61 received platelet gel intraoperatively), Gardner et al.[81] found that patients who received platelet gel had less difference in preoperative and postoperative hemoglobin levels on day 3 (2.7 vs. 3.2 g/dl; $p = 0.026$), which was considered as an indicator of blood loss.

In a retrospective study, Berghoff et al.[82] found that administration of platelet-rich and platelet-poor plasma during wound closure is associated with a better hemoglobin profile and a lower rate of transfusion.

In an RCT, 66 THA patients were randomized to one of the three following groups (1) a 10 mg/kg bolus of TA before operation; (2) 10 mL of fibrin spray during the operation, or (3) a control (neither TA nor fibrin spray administered).[83] The authors suggested that topical fibrin spray and IV TA both reduce the amount of blood loss significantly compared to the controls. There was no statistically significant difference between the fibrin spray and TA groups regarding the amount of blood loss.

In an RCT of 100 THA, patients were assigned to the study group (receiving autologous fibrin tissue adhesive) or control (no fibrin tissue adhesive) group.[84] The results of this RCT showed a significantly lower amount of blood loss in the fibrin tissue adhesive at 580 ± 240 ml compared to the controls at 810 ± 341 ml.

In an RCT, 81 patients who underwent THA were assigned to receive standard of care plus fibrin sealant (10 ml total) or standard of care without fibrin sealant. In the fibrin sealant group, the amount of blood loss decreased significantly by 23.5%.[81]

The results of two RCTs showed that the administration of fibrin products is associated with reduced blood drainage from the wound and blood loss as well as blood transfusion in TKA patients.[85–87]

Question 8: What is the role for blood salvage (intraoperative and postoperative) during the second stage of two-stage exchange arthroplasty for treatment of PJI?

Consensus

The role of blood salvage (intraoperative and postoperative) during the second stage exchange arthroplasty is inconclusive. Blood salvage should be utilized with caution.

Delegate Vote
Agree: 80%, Disagree: 11%, Abstain: 9% (Strong Consensus)

Justification
The efficacy of a cell salvage system has been shown in orthopedic surgeries.[88] Although there is no strong evidence regarding the contraindication of cell salvage in PJI cases, traditionally the presence of infection is considered as a contraindication for use of this type of system.[89] However, some authors have suggested that cell salvage can be used in infected cases. Leukocyte depletion filters can be used to filter any salvaged blood. These filters are effective at removing WBC counts and bacterial loads up to 10^4 CFU/ml. Any residual bacteria would be treated by perioperative antibiotics in the same way they would for any bacteremia that occurs during the surgery.[35]

In a Cochrane systematic review, RCTs in which adult patients undergoing elective surgeries were randomized to either a cell salvage group or a control group (no intervention), were evaluated.[88] The results of this systematic review indicated that in orthopedic procedures the relative risk of exposure to red blood cell transfusion in patients receiving cell salvage systems drops to 0.46 (95% CI: 0.37–0.57) and the use of cell salvage systems was not associated with any adverse events.

Question 9: What is the role of administration of erythropoietin, hematinics, or other agents between the two stages of exchange arthroplasty for the treatment of PJI?

Consensus
Treatment of preoperative anemia with iron, with or without erythropoietin, will reduce the risk of transfusion in patients undergoing TJA.

Delegate Vote
Agree: 78%, Disagree: 9%, Abstain: 13% (Strong Consensus)

Justification
There is evidence to suggest that treatment of preoperative anemia with iron, with or without erythropoietin, will reduce the risk of transfusion in patients undergoing TJA.[90] However, some authors suggest that for patients undergoing TJA, anemia should be investigated rather than treated empirically as the risk of gastrointestinal malignancy and/or gastrointestinal bleeding is present.

A systematic review by Spahn[90] indicated that treatment of preoperative anemia with iron, with or without erythropoietin, will reduce the risk of transfusion in patients undergoing TJA.

A double-blind, multicenter RCT compared two regimens of Epoetin-α in reducing the need for allogeneic blood transfusion in patients undergoing THA. Patients were assigned to receive 4 weekly doses of Epoetin-α, 40,000 units (high-dose; $n = 44$) or 20,000 units (low-dose; $n = 79$), or placebo ($n = 78$), starting 4 weeks before surgery. Oral iron supplementation (450 mg/day) for 42 or more days before surgery was administered in all cases. The results of this RCT revealed that both regimens were effective in reducing the need for allogeneic blood transfusion. Patients who received a high-dose regimen had the lowest rate of transfusion.[91]

In two studies by Delasotta et al.[92,93] the authors showed that in mildly anemic patients who undergo revision TKA or THA, administration of Epoetin-α decreases the rate of transfusion.

Question 10: Are self-contained suction suction devices a source of contamination?

Consensus
There is evidence indicating that the tip of surgical suction drains can be a source of contamination.

Delegate Vote
Agree: 70%, Disagree: 9%, Abstain: 21% (Strong Consensus)

Justification
A few studies indicate that microorganisms can be obtained from a considerable number of cultures from the tip of surgical suctions. However, there is no evidence indicating that there is a correlation between the tip of suction contamination and subsequent SSI/PJI.

Robinson et al.[94] assessed the colonization of the suction tip in an ultraclean-air operating theater in 39 patients and found evidence of bacterial contamination in 41% of them. Similarly, Strange-Vognsen and Klareskov[95] obtained positive cultures from 12 out of 22 suction tips used in THA.

Question 11: What is the role of preoperative autologous blood donation between the two stages of exchange arthroplasty for PJI?

Consensus
There is no role for autologous blood donation between the two stages of exchange arthroplasty for PJI.

Delegate Vote
Agree: 83%, Disagree: 7%, Abstain: 10% (Strong Consensus)

Justification
To the best of our knowledge, there is no single study about the role of autologous blood donation between the two stages of exchange arthroplasty. However, due to the theoretical risk of spreading infection, blood banks refuse to accept blood donation from patients with infection or those suspected of having an infection.

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