

KNEE – REDUCED BLOODLOSS

Conteduca F. et al. (2009)

- Blood loss reduction by 15% when using navigation.
- Benefits of CAS are decrease of blood loss, better alignment and potentially better long-term outcome.

Schnurr C. et al. (2010)

- With CAS there is no need for opening of the femoral medullary canal. This leads to 14% decreased average blood loss.
- Fewer amounts of blood transfusions required.

Millar N.L. et al. (2010)

- Blood loss reduction of 21% across all BMI's
- Morbidly obese patients benefit of navigation

Chauhan S.K. et al. (2004)

- Significantly less mean blood loss in CAS group (44% reduction)
- Significant better alignment of the components with CAS



Blood loss in computer-assisted mobile bearing total knee arthroplasty. A comparison of computer-assisted surgery with a conventional technique.

Int Orthop, 2009, 33, 1609-1613

Conteduca F. et al.

ABSTRACT

Computer-assisted surgery (CAS) in total knee arthroplasty (TKA) could be useful in reducing the overall blood loss. A prospective randomised study was performed with two groups of 50 patients each of whom were treated for knee arthritis. Patients of group A were treated by a conventional standard procedure, while for patients of group B a specific CAS procedure was used. We determined the intraoperative blood loss according to the Orthopaedic Surgery Transfusion Haemoglobin European Overview (OSTHEO) study. The average blood loss in patients of group A was 1,974 ml (range: 450–3,930 ml) compared to 1,677 ml of patients of group B (range: 500–2,634 ml).

A statistically significant difference was found between the two groups ($p=0.0283$). Computer-assisted surgery is highly recommended in TKR to save blood. It creates more possibilities to operate on anaemic patients and subjects who cannot accept blood products by reducing blood loss risk.

SUMMARY

In a randomized controlled trial including 100 patients the blood loss was determined for both the conventional group A and the navigated group B (Brainlab system used). A statistically significant difference in the mean total blood loss was detected comparing the two groups.

CONCLUSION

Blood loss reduction by 15% when using navigation.

“The mean total blood loss was 1,974 ml [...] in [the conventional] group A and 1,677 ml [...] in [the navigated] group B”

“We believe that CAS with a minimally invasive approach can reduce blood loss in total knee replacement especially since the intramedullary femoral hole is avoided.”

“Computer-assisted surgery is highly recommended in TKR to save blood”

Benefits of CAS are decrease of blood loss, better alignment and potentially better long-term outcome.

“We believe that the observed decrease of blood loss is one of the benefits of CAS. Better alignment of the limb and, maybe, a better long-term outcome can also be expected with this innovative procedure.”



The Effect of Computer Navigation on Blood Loss and Transfusion Rate in TKA

Orthopedics, July 1, 2010

Schnurr C. et al.

ABSTRACT

The blood loss that accompanies total knee arthroplasty (TKA) can be substantial. Many patients need perioperative blood transfusions. To avoid anemia and transfusion-related complications, the amount of blood loss and need for blood transfusions must be reduced. If standard jig instruments are used, an opening of the femoral medullary canal is required. This operative step has been recognized as a reason for elevated blood loss; it is not required if computer navigation is used. Hence, the purpose of this study was to investigate the effect of computer navigation on blood loss and transfusion rate in TKA.

The data of 500 consecutive patients undergoing TKA were analyzed, and patient- and operation-related data and blood loss and transfusion rates were recorded. The total blood loss was calculated by use of the Orthopedic Surgery Transfusion Hemoglobin European Overview (OSTHEO) formula.

The average blood loss in the drainages (standard procedures, 880 mL; navigated procedures, 761 mL; $P=.001$) and the calculated total blood loss (standard procedures, 1375 mL; navigated procedures, 1242 mL; $P=.036$) were significantly reduced in the navigation group.

The transfusion rate of navigated procedures was almost halved (standard procedures, 0.23 transfusions/patient; navigated procedures, 0.12 transfusions/patient; $P=.035$).

Our study demonstrated a reduced blood loss if TKAs were implanted by use of computer navigation. The diminished blood loss resulted in a 50% reduction of allogenic blood transfusions. Hence, computer navigation may be attractive for patients with a high risk of transfusions or uncommon blood groups.

Prospective studies are required to verify this potential benefit of computer navigation.

SUMMARY

Retrospective analysis of a cohort of 500 patients who underwent either standard TKA or navigated (Brainlab system used) TKA. Using standard jig instruments, an opening of the femoral medullary canal is required. This operative step is not required if navigation is used. The purpose of this study was to investigate the effect of navigation on blood loss and transfusion rate in TKA.

CONCLUSION

With CAS there is no need for opening of the femoral medullary canal. This leads to 14% decreased average blood loss.

“The average blood loss in the drainages (standard [...] 880 ml; navigated [...] 761 ml) and the calculated total blood loss (standard [...] 1375 ml; navigated [...] 1242 ml) were significantly reduced in the navigation group”

(continued...)

Fewer amounts of blood transfusions required.

“The diminished blood loss resulted in a 50% reduction of allogenic blood transfusions Hence, computer navigation may be attractive for patients with a high risk of transfusions or uncommon blood groups.



Blood loss following total knee replacement in the morbidly obese: Effects of computer navigation.

Knee. 2010 Jun 28. [Epub ahead of print]

Millar N.L. et al.

ABSTRACT

Computer navigated total knee arthroplasty (TKA) has several proposed benefits including reduced post operative blood loss. We compared the total blood volume loss in a cohort of morbidly obese (BMIN40) patients undergoing computer navigated (n=30) or standard intramedullary techniques (n=30) with a cohort of matched patients with a BMI<30 also undergoing navigated (n=31) or standard TKA (n=31). Total body blood loss was calculated from body weight, height and haematocrit change, using a model which accurately assesses true blood loss as was maximum allowable blood loss which represents the volume of blood that can be lost until a transfusion trigger is required. The groups were matched for age, gender, diagnosis and operative technique.

The mean true blood volume loss across all BMI's was significantly (pb0.001) less in the computer assisted group (1014±312 ml) compared to the conventional group (1287±330 ml). Patients with a BMIN40 and a computer navigated procedure (1105±321 ml) had a significantly lower (pb0.001) blood volume loss compared to those who underwent a conventional TKA (1399±330 ml).

There was no significant difference in the transfusion rate or those reaching the maximum allowable blood loss between groups. This study confirms a significant reduction in total body blood loss between computer assisted and conventional TKA in morbidly obese patients.

However computer navigation did not affect the transfusion rate or those reaching the transfusion trigger in the morbidly obese group. Therefore computer navigation may reduce blood loss in the morbidly obese patient but this may not be clinically relevant to transfusion requirements as previously suggested.

SUMMARY

Prospective matched cohort study including 122 patients comparing standard and navigated TKA in patients with BMI>40 and BMI<30. The primary research question was to determine how surgical technique affected the total blood loss in the morbidly obese patient and whether this was clinically relevant.

CONCLUSION

Blood loss reduction of 21% across all BMI's

“[...] mean true blood volume loss across all BMI's was significantly less in the computer assisted group (1014±312ml) compared to the conventional group (1287±330ml)”

(continued...)

Morbidly obese patients benefit of navigation

“Our results show that computer navigation results in a significantly reduced total blood volume loss and haemoglobin loss compared to non-navigated total knee arthroplasty in the morbidly obese patients.”

“[...] computer navigation caused no increased incidence of post-operative superficial infection in the morbidly obese and actually reduced the rate in the non-obese patient [...]”



Computer-assisted knee arthroplasty versus a conventional jig-based technique. A randomised, prospective trial

J Bone Joint Surg Br. 2004 Apr; 86(3):372-7

Chauhan S.K. et al.

ABSTRACT

We have compared a new technique of computer-assisted knee arthroplasty with the current conventional jig-based technique in 70 patients randomly allocated to receive either of the methods. Post-operative CT was performed according to the Perth CT Knee Arthroplasty protocol and pre- and post-operative Maquet views of the limb were taken. Intra-operative and peri-operative morbidity data were collected and blood loss measured. Post-operative CT showed a significant improvement in the alignment of the components using computer-assisted surgery in regard to femoral varus/valgus ($p = 0.032$), femoral rotation ($p = 0.001$), tibial varus/valgus ($p = 0.047$) tibial posterior slope ($p = 0.0001$), tibial rotation ($p = 0.011$) and femorotibial mismatch ($p = 0.037$). Standing alignment was also improved ($p = 0.004$) and blood loss was less ($p = 0.0001$). Computer-assisted surgery took longer with a mean increase of 13 minutes ($p = 0.0001$).

SUMMARY

Randomized Controlled Trial comparing computer-assisted and conventional jig-based TKA on 70 patients. All patients received a post-operative CT to determine alignment values and the blood loss was measured during the first 24 hours after surgery.

CONCLUSION

Significantly less mean blood loss in CAS group (44% reduction)

“[...] the mean blood loss was 252 ml (25 to 620) whereas in the conventional group it was 446 ml (100 to 1100).“

“We observed more loss of blood in the conventional group than in the computer-assisted group. We believe this to be due partly to non-penetration of the femoral medullary canal but also to care in soft-tissue management.”

Significant better alignment of the components with CAS

“Post-operative CT showed a significant improvement in the alignment of the components using computer-assisted surgery in regard to [...] femoral rotation [and] tibial posterior slope.”