Cement-in-cement versus uncemented modular stem revision for Vancouver B2 periprosthetic fractures

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Introduction

The incidence of periprosthetic fractures (PPF) of the femur following total hip arthroplasty is rising. The Vancouver classification can be used to describe fracture pattern, with B2 being the commonest subtype, for which revision to a long uncemented tapered fluted stem is a widely accepted management. ORIF and cement-in-cement revision has been proposed as an alternative that can shorten operative time and blood loss, but there is limited evidence for this technique.

Aims

To compare long uncemented revision to cement-in-cement revision for Vancouver B2 PPF.

Methods

All patients undergoing surgical intervention for a Vancouver B2 femoral PPF in a cemented stem from 2008 – 2018 were identified. We collated patient age, gender, ASA score, BMI, operative time, blood transfusion requirement, change in haemoglobin (Hb) level, length of hospital stay and last Oxford Hip Score (OHS). Radiographic analysis was performed to assess time to fracture union and stem subsidence. Complications and survivorship of implant and patients were recorded.

Results

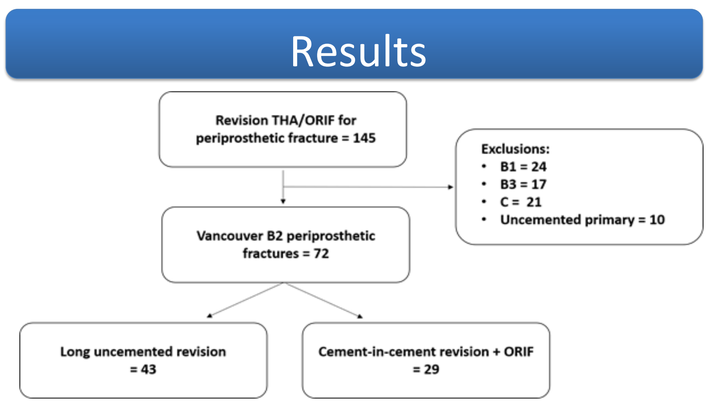

Figure 1: CONSORT diagram illustrating patients excluded from final analysis.

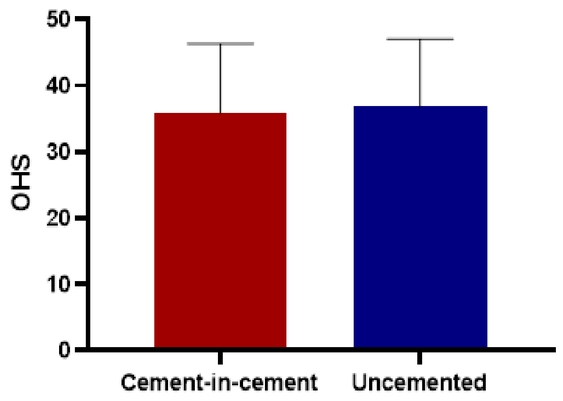

Figure 2: There was no difference in Oxford Hip Scores between groups.

Radiographic analysis

- Two non-unions occurred in the uncemented group. There were no non-unions in the cement-in-cement group.
- There was no difference in median time to radiological union between groups.
- Stem subsidence was significantly increased in the uncemented group (mean 2.3 mm *cf* 0.4 mm)

	Cement-in-cement	Uncemented	p value
Operative time, mins (+/-SD)	140 (44)	160 (34)	0.036
Mean units transfused (+/-SD)	1.8 (1.8)	1.8 (1.7)	0.995
Hb change (g/L)	18.0	15.1	0.402
Median LoS, days (+/-SD)	13 (24.5)	16 (34.0)	0.423
Complication rate	34.5%	48.8%	0.084

Table 1: Operative time was significantly shorter in the cement-in-cement group.

	Cement-in-cement (%)	Uncemented (%)	p value
Dislocation	0 (0)	8 (18.6)	0.014
Intra-op fracture	0 (0)	2 (4.7)	0.512
Post-op periprosthetic fracture • Vancouver B1 • Vancouver C	3 (10.3) • 2 (6.9) • 1 (3.4)	2 (4.7) • 1 (2.3) • 1 (2.3)	0.429
Prosthetic joint infection	4 (13.8)	4 (9.3)	0.706
Wound infection	1 (3.4)	1 (2.3)	>0.999
Heterotopic ossification	0 (0)	2 (4.7)	0.512
Pneumonia	2 (6.9)	3 (7.0)	>0.999
TIA	0 (0)	1 (2.3)	>0.999
Death	0 (0)	3 (7.0)	0.265

Table 2: 48.8% of the uncemented group suffered at least one complication. 34.5% of the cement-in-cement group suffered at least one complication.

There was a significantly higher dislocation rate in the uncemented group.

	Cement-in-cement (%)	Uncemented (%)
Instability	0 (0)	4 (9.3)
Periprosthetic fracture	3 (10.3)	0 (0)
Infection	2 (6.9)	3 (7.0)
Acetabular aseptic loosening	0 (0)	1 (2.3)

Table 3 : 18.6% of the uncemented group and 17.2% of the cement-in-cement group underwent re-revision surgery.

50% of re-revisions in the uncemented group were for instability.

60% of re-revisions in the cement-in-cement group were for further peri-prosthetic fracture.

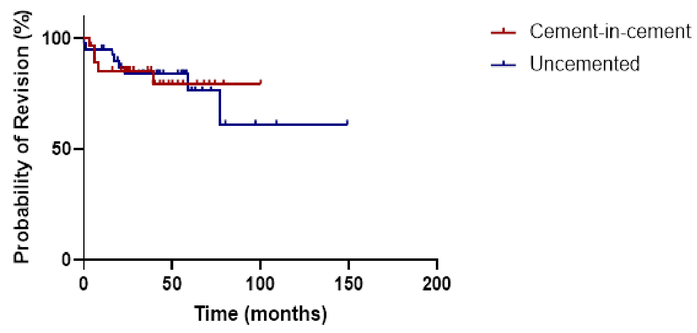

Figure 3: Kaplan-Meier analysis. There was no difference between groups for re-revision (p=0.955) or survival time (p=0.572).

Discussion

This is one of the first studies directly comparing the outcomes of cement-in-cement with long uncemented revision for Vancouver B2 fractures.

A significant reduction in operative time and lower rates of certain complications were found in the cement-in-cement group. There was no increase in revision rate or fracture non-unions following this procedure and functional outcomes were comparable in this short-term follow-up.

Although re-revision rates were comparable, reasons for revision differed. In the uncemented group, recurrent dislocation accounted for 50% of cases. By comparison, the majority of re-revisions in the uncemented group were for further PPF.

The reason for the higher dislocation rate in the uncemented group is not clear, but may be a result of post-operative femoral version and soft tissue tension being more closely matched to pre-operative levels given the implants were comparable and the cement mantel retained. This suggests a dual mobility or constrained cup should be considered when undertaking revision to a long uncemented component.

There are limitations to this study, including small sample size and no randomisation of surgical procedure. Rather, surgeon preference dictated the choice of operation. The effect of this selection bias is difficult to quantify. In addition, the follow-up is a minimum of 2 years but longer follow-up would be needed to confirm the ultimate outcome of the cement-in-cement technique.

Conclusion

With appropriate patient selection, both cement-in-cement and long uncemented tapered stem revision represent appropriate treatment options for Vancouver B2 fractures.