



Do Different Techniques Influence Blood Loss During Pedicle Subtraction Osteotomy in Adult Deformity Surgery?

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Background/ introduction

Pedicle Subtraction Osteotomy (PSO) is the workhorse of adult deformity surgery. It is known to be associated with increased intraoperative blood loss and subsequent need for postoperative transfusion[1-3]. Different techniques and instruments are employed for PSO. Any change in the technique which can reduce Total Blood Loss (TBL) will positively impact the peri-operative risk profile

Purpose of the study

This study aims to compare Total Blood Loss (TBL) in PSO utilizing 3 techniques and instruments in adult deformity surgery.

Materials and Methods

Retrospective analysis of medical records of patients undergoing single level lumbar PSO by the senior author over 5 year period was carried out by a blinded reviewer. After excluding PSO for other pathologies, 15 patients who had undergone single PSO in the lumbar spine for degenerative adult deformity were identified. They were enrolled in three Groups depending on the technique used to perform the PSO. In Group A (5 Patients) PSO had been carried out using standard general orthopedic instruments. Group B (5 patients) received PSO using dedicated osteotomy instruments, whilst in Group C (5 patients) PSO was carried out by a combination of dedicated osteotomy instruments and Ultrasonic Bone Scalpel UBS. Mean and range of total blood loss was calculated and the results were analyzed statistically using one-tailed Mann-Whitney U Test.

Results

Mean TBL group C: 697ml (250-1500), group B: 1638ml (850-4000), and group A: 2120 ml (700-2800). Group C had the lowest mean TBL and Group A the highest. In group C there was no need for transfusion whilst all patients in group A and some of that in group B received blood transfusion. There was statistically significant difference in the intraoperative TBL when comparing group C and B ($p \leq 0.037$, $U = 3.5$). This difference was even more significant when group C was compared with group A ($p \leq 0.018$, $U = 2$). Although Mean TBL in group A was higher than Group B the difference did not reach statistical significance ($p \leq 0.064$, $U = 9$).

Discussion

In our case series we observed a significantly lower mean Total Blood Loss when performing PSO using UBS and dedicated osteotomy kit compared to dedicated or generic instrumentation alone. The UBS allows tissue specific cutting of bone whilst protecting soft tissue. It has gained favour in various applications for spinal surgery. The device allows for precision cuts of vertebra whilst also producing a local haemostatic effect. Several studies have attributed this to the coagulation of marrow interstices during cutting and noted a reduction in blood loss during surgery when using this device[4-5].

Conclusion

Based on our results in this limited number of patients, the use of an ultrasonic bone scalpel combined with a dedicated osteotomy set to perform PSO appears to reduce TBL in spinal procedures which involve PSO. The limitations of our study are the limited number of patients and the retrospective nature of our observation.

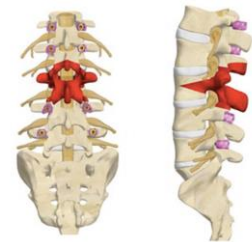


Fig 1. 2 Pedicle Subtraction Osteotomy PSO

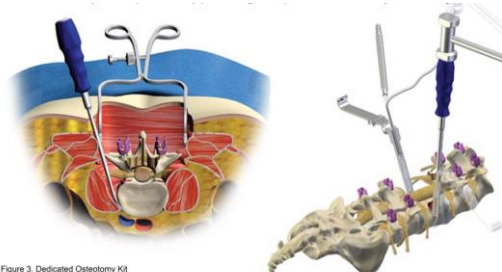


Figure 3. Dedicated Osteotomy Kit



Figure 5. Intraoperative fluoroscopy - ultrasonic bone scalpel



Figure 6. Ultrasonic bone scalpel (UBS)

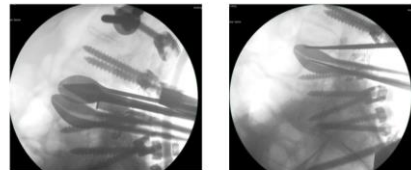


Figure 4. Intraoperative fluoroscopy - dedicated osteotomy kit

Group	Mean TBL
A (generic kit)	2120 ml (range 700-2800ml)
B (dedicated osteotomy kit)	1638ml (range 850-4000ml)
C (dedicated osteotomy kit + ultrasonic bone saw)	697ml (range 250-1500ml)

References.

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