Postoperative Outcomes of Ponte-ostetomies vs. No Osteotomies in The Treatment of Thoracic Adolescent Idiopathic Scoliosis (AIS) – A Randomized Clinical Trial

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INTRODUCTION:

Ponte osteotomies (PO) are routinely used to facilitate curve correction in surgical treatment of adolescent idiopathic scoliosis (AIS). Data regarding routine use of PO is controversial, with conflicting data for coronal and sagittal plane correction and clinical benefit. Use of PO has not been studied in the surgical treatment of AIS in a randomized clinical trial.

METHODS:

A randomized, multicenter clinical trial on adolescents undergoing posterior spinal fusion for AIS using pedicle screw instrumentation. One hundred and four consecutive AIS patients scheduled for segmental pedicle screw instrumentation for AIS were prospectively randomized to PO (n=51) and non-PO (n=53) groups. PO group received minimum two and maximum four Ponte-osteotomies in the apical area of the deformity. Pre- and postoperative radiographs were analyzed. Data on blood loss, surgical time, and complications were prospectively collected.

RESULTS:

Mean (SD) preoperative major curve was 51.6° (9.2°) in the PO and 51.5° (8.0°) in the non-PO group and 15.4° (4.5°) and 15.8° (5.0°) postoperatively, respectively (p=0.94). Preoperative thoracic kyphosis (T5-T12) was 15.8° (9.8°) in PO group and 18.8° (11.7°) in non-PO group (p=0.16). Postoperative kyphosis was 20.1° (5.5°) in PO group and 18.1° (7.1°) in non-PO group (p=0.12). Thoracic kyphosis increased in PO group 5.1° and decreased in non-PO group 0.72° (p=0.002). Thoracic kyphosis was in normal range (20°-40°) in 25/51 patients in PO group and 17/53 patients in non-PO group postoperatively (p=0.08). In subgroup analysis of AIS patients with preoperative kyphosis of less than 20° postoperative kyphosis was 18.2° (5.5°) in PO group and 15.5° (4.9°) in non-PO group (p=0.05). Intraoperative blood loss was 602 (355) mL in the PO and 613 (361) mL in the non-PO group (p=0.88). The surgical time was 155 (34) min in the PO and 157 (47) min in the non-PO group (p=0.88). There were two neurophysiological events with loss of motor evoked potentials in PO group due to misplaced thoracic pedicle screw detected by intraoperative advanced imaging. Both had full recovery after screw removal. One patient in PO group had deep vein thrombosis requiring thrombectomy 4 weeks postoperatively.

DISCUSSION AND CONCLUSION:

Use of Ponte-osteotomies facilitate better sagittal balance correction in thoracic AIS patients undergoing segmental pedicle screw instrumentation with minimal effect on surgical blood loss and time.

	Non-Ponte osteotomy (n=53)	Ponte osteotomy (n=51)	P-value
Preoperative Main Thoracic Curve	51.5° (8.0°)	51.6° (9.2°)	0.94
Postoperative Main Thoracic Curve	15.8° (5.0°)	15.4° (4.5°)	0.65
Preoperative Proximal Thoracic Curve	25.2° (12.1°)	25.2° (10.6°)	0.99
Postoperative Proximal Thoracic Curve	13.2° (6.1°)	13.4° (6.8°)	0.95
Preoperative Lumbar Curve	36.3° (13.7°)	36.6° (12.1°)	0.91
Postoperative Lumbar Curve	12.2° (6.1°)	12.7° (6.3°)	0.73
Preoperative Thoracic Kyphosis	18.8° (11.7°)	15.8° (9.8°)	0.16
Postoperative Thoracic Kyphosis	18.1° (7.1°)	20.1° (5.5°)	0.12
Change in Thoracic Kyphosis (°)	-0.72 (9.9)	+5.1 (9.1)	0.002
Postoperative kyphosis 20°-40° (%,n/n)	32% (17/53)	49% (25/51)	0.08
Preoperative Lumbar Lordosis	44.8° (13.8°)	43.8° (9.9°)	0.68
Postoperative Lumbar Lordosis	44.9° (16.2°)	42.8° (15.1°)	0.49
Fused vertebrae	11.3 (1.7)	11.2 (1.7)	0.75
Screw density	1.96 (0.03)	1.92 (0.14)	0.39
Number of Ponte osteotomies	N/A	2.4 (0.6)	N/A
Blood loss (ml)	613 (361)	602 (355)	0.88
Surgical time (min)	156 (35)	157 (47)	0.82