Computer-Assisted Rod Contouring in Deformity Surgery. Is it Worth it?

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INTRODUCTION

- In adult spinal deformity surgery, rod-contouring is a critical step that determines postoperative alignment.
- While the rod is traditionally contoured manually, novel computer-assisted systems have emerged in the hopes of minimizing operation time and blood loss, and improving accuracy.
- However, these systems require aggressive bending that may increase risk of rod fractures.
- Incidence of fracture after computer-assisted contouring versus that after manual contouring has been poorly reported.

METHODS

- We retrospectively reviewed a prospectively maintained database of consecutive cases at our institution from January 2016 through November 2021 .
- Inclusion criteria were age >18, fusion of ≥5 vertebrae, and rod implantation, and minimum 1 year follow-up with radiographs. Patients were divided into computer-assisted (CA) group and traditional-contouring (TC) groups .
- Incidence of rod fracture between the groups was determined
- Mann-Whitney nonparametric test was used to compare medians between the groups
- A P value < 0.05 was considered statically significant.

Breakdown of Patient Population

Table 1. Distribution of patients according to age, sex and Body Mass Index (BMI) in studied groups

Variable		MIS (n = 32)		Open (n = 145)		Z; P
Age (years)	**n**	**%**	**n**	**%**		
33 – 39	0	.0	4	2.8		Z= .29; P= .39
40 – 49	0	.0	5	3.4		Z= .48; P= .32
50 – 59	6	18.8	39	26.9		Z= .73; P= .23
60 – 69	15	46.9	60	41.4		Z= .37; P= .35
70 – 80	11	34.4	37	25.5		Z= .81; P= .21
Sex	**n**	**%**	**n**	**%**		
Masculine	18	56.3	86	59.3		Z= .12; P= .45
Femenine	14	43.8	59	40.7		Z= .12; P= .45
BMI	**n**	**%**	**n**	**%**		
<18.5	1	3.1	1	.7		Z= .26; P= .39
18.5 - 24.9	10	31.3	26	17.9		Z= 1.45; P= .07
25.0 - 29.9	11	34.4	48	33.1		Z= .07; P= .47
30.0 - 34.9	6	18.8	41	28.3		Z= .88; P= .19
35.0 - 39.9	3	9.4	23	15.9		Z= .66; P= .25
40.0 and more	1	3.1	6	4.1		Z= .23; P= .41
Total	**32**	**100**	**145**	**100**		**-**
Age years (Md ± ICR)*		66.5 ± 9.5		63.0 ± 13.0		Z= 1.72; P= .09
BMI (Md ± ICR)*		27.18 ± 7.81		29.50 ± 7.76		Z= 1.83; P= .05

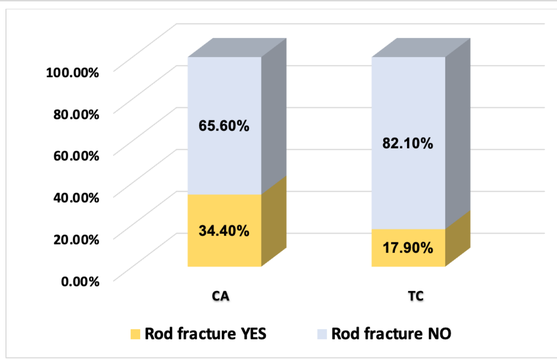
Md ± ICR: Median ± Interquartile Rank
*Mann-Whitney non-parametric test

Table 2. Association between type of surgery and occurrence of rod fracture

			Rod fracture		
			Yes	No	Total
Group	**MIS**	n	11	21	32
		%	34.4%	65.6%	100%
	Open	n	26	119	145
		%	17.9%	82.1%	100%
Total		**n**	**37**	**140**	**177**
		%	**20.9%**	**79.1%**	**100%**

□²= 3.35; 1 freedom degree; P= .07
RR= 1.92; CI 95%: 1.06 – 3.47
Incidence of rod fracture, MIS vs Open: 34.4% *vs* 17.9%. Z= 1.83; P= .03

	Group		Z; P
	MIS	**Open**	
Rod fracture	**34.4%**	**17.9%**	**Z= 1.83; P= .03**



P= 0.03 **Incidence of rod fracture: CA vs TC**

RESULTS:

- 177 patients were identified, with 32 CA and 145 TC.
- The most frequent age range was 60-69 years in both groups: CA 46.9% (n=15) and TC 41.4% (n=60).
- There were no differences between the groups in age, sex or body mass index (*p*>.05). Rod fracture incidence was 34.4% in the CA group versus 17.9% in the TC group (Z=1.83; *p*=0.03).
- The risk of presenting rod fracture in the MIS group was 1.92 times higher than those who underwent open surgery.

CONCLUSIONS

- The use of computer-assisted rod-contouring in deformity surgery was associated with a higher incidence of rod fractures.
- This can predispose patients to pseudoarthrosis, postoperative pain, neurologic deficit, and reoperation.
- Increased risk of fracture may be due to aggressive bending and notching of the rod that is associated more with computer-assisted systems than with traditional manual systems

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