Complete Elbow Ankylosis Secondary to Heterotopic Ossification: Operative Management Leads to Fair to Excellent Long-Term Outcomes

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INTRODUCTION:

Heterotopic ossification (HO) in the elbow, often caused by trauma or neurogenic factors, can lead to limited range of motion and physical impairment, while severe cases may result in debilitating loss of function. Complete bony ankylosis of the elbow, though rare, presents challenges in treatment due to complex anatomy and high recurrence rates, with limited literature on management and outcomes. This study retrospectively investigates cases of elbow ankylosis secondary to HO, assessing long-term functional outcomes following operative intervention and standardized rehabilitation.

METHODS:

A retrospective case series was performed on patients who underwent surgical excision of heterotopic ossification of the elbow at our institution. Outcomes of interest were intraoperative flexion-extension arc, flexion-extension arc at final long-term postoperative follow-up, visual analog scale pain scores at long-term follow-up, and Mayo Elbow Performance Scores at long-term follow-up. Wilcoxon signed-rank test was performed to identify a statistically significant difference between arc of motion achieved intraoperatively and the arc of motion maintained at final long-term postoperative follow-up.

RESULTS:

Between September 1999 and July 2021, 107 patients underwent operative resection for heterotopic ossification around the elbow, with 13 patients (16 elbows) exhibiting complete ankylosis at time of surgery. Patients were followed for a minimum of two years. Long-term outcomes demonstrated a mean VAS pain score of 1.4 +/- 1.7, and a mean MEPS of 85.9 +/-12.8, with 75% of cases maintaining at least 100 degrees of flexion-extension arc at final long-term postoperative follow-up. On average, the flexion-extension arc of motion at final follow-up was preserved at 95% of intraoperative levels. Patients did have a mean residual flexion contracture of 18 +/- 9 degrees at final follow-up.

DISCUSSION AND CONCLUSION:

Surgical excision for complete elbow ankylosis secondary to heterotopic ossification presents challenges due to potential complications. Our study shows favorable long-term outcomes in pain scores, range of motion, and Mayo Elbow Performance Scores (MEPS). Despite reported complications in the literature, our series exhibited no adverse events, supporting operative excision as a standard treatment with overall fair to excellent outcomes. Further research, particularly involving multicenter, randomized, prospective studies, is warranted to refine protocols and understand predictors for improved outcomes in this patient population.

Figures and Tables Legends

Figure 1. Lateral (A) and anteroposterior (B) radiographs of the left elbow of one patient in this series demonstrating evidence of complete ankylosis secondary to severe heterotopic ossification of the elbow.

Figure 2. Sagittal (A), Coronal (B), and 3-dimensional reconstruction (C) of a computed tomography scan of the right elbow of one patient in this series demonstrating evidence of complete ankylosis secondary to severe heterotopic ossification of the elbow.

Table 1. Range of Motion, Mayo Elbow Performance Score, and Visual Analog Scale at Long-term Follow-up

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	Preoperative				Surgical Approach	Intraoperative			Range of Motion at Final Follow-up			MEPS at final f/u	VAS at final f/u	F/u (years)	Change from Preoperative to Final F/u		
Case #	S I	Ext	Flex	Arc		Ext	Flex	Arc	Ex	Flex	Arc				Ext	Flex	Arc
1	L	70	70	0	Medial	15	95	80	20	80	60	70	1	4	50	10	60
2	R	40	40	0	Extended postero-medial	10	125	115	10	125	115	70	3	18.5	30	85	115
3	L	100	100	0	Posterior	10	140	130	20	130	110	100	0	18	80	30	110
4	L	90	90	0	Posterior	30	135	105	30	135	105	85	2	3	60	45	105
5	R	50	50	0	Posterior	10	130	120	20	120	100	85	3	16.5	30	70	100
6	L	60	60	0	Posterior	20	110	90	20	120	100	85	3	17	40	60	100
7	L	20	20	0	Medial + Lateral	10	80	70	30	120	90	95	0	2	-10	100	90
8	L	120	120	0	Medial	0	120	120	0	140	140	100	0	12.5	120	20	140
9	R	50	50	0	Posterior	10	140	130	5	140	135	90	0	11.5	45	90	135
10	L	90	90	0	Posterior	30	125	95	20	105	85	75	4	9.5	70	15	85
11	L	90	90	0	Postero-lateral	0	120	120	10	110	100	60	5	6	80	20	100
12	R	90	90	0	Posterior	-5	135	140	20	125	105	100	0	2	70	35	105
13	L	75	75	0	Postero-medial + Lateral	40	130	90	5	135	130	100	0	6	70	60	130
14	R	80	80	0	Medial + Lateral	0	140	140	25	125	100	100	0	3.5	55	45	100
15	R	70	70	0	Posterior	20	120	100	20	115	95	80	1	2	50	45	95
16	L	90	90	0	Postero-lateral	10	130	120	30	140	110	80	1	7	60	50	110
Mean		**74**	**74**	**0**		**13**	**123**	**110****	**18**	**123**	**105***	**86**	**1.4**	**8.7***	**56**	**49**	**105**

*Mean years of follow-up for patients with complete ROM, MEPS, and VAS data.
**Per Wilcoxon signed-rank test, there was no significant difference between intraoperative arc and arc at final follow-up (p = 0.31).