The Use of Motorized Cold Therapy Unit in the Postoperative Period Influences Pain and Narcotic Use following Arthroscopic Rotator Cuff Repair

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INTRODUCTION: Opioid overdose is a leading cause of injury-related death in the United States, prompting calls for reform in surgical prescription practices. Cold Therapy Units (CTUs) have been widely accepted as an adjunct to pharmacologic therapy for pain management, but these devices are not consistently reimbursed by insurance companies and have not been extensively studied in arthroscopic shoulder surgery. The purpose of our study is to assess the impact of a standardized CTU protocol on postoperative pain and opioid consumption following arthroscopic rotator cuff repair (ARCR), along with its effects on early post-operative shoulder functional outcomes.

METHODS:

A prospective cohort trial was conducted on adult patients undergoing primary ARCR between 6/2023-11/2024. Patients were instructed to use a commercial CTU at least four times daily in 30-minute sessions for a minimum of two weeks. Patients documented pain levels and opioid use during their first postoperative week. Patient-reported outcome (PRO) measures, including the Visual Analog Scale (VAS), Disability of Arm, Shoulder, and Hand (DASH), and American Shoulder and Elbow Surgeons (ASES) scores, were collected preoperatively and at 6 weeks, 3 months, and 6 months postoperatively. A historical cohort which followed the same multimodal pain management protocol but without use of CTU served as a control group for comparison.

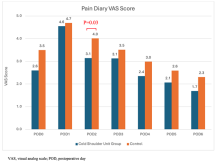
RESULTS:

50 patients in the CTU group and 51 patients in the control group were included with no significant differences in demographics between groups. Intraoperatively, there was no difference in distribution of constructs used or number of tendons repaired. VAS scores were lower in the CTU group throughout the first postoperative week, which was significant on POD2 (3.1 vs. 4.0, p=0.03). The amount of mean total morphine milligram equivalents (MME) used in the first postoperative week was significantly lower in the CTU group (115.2 ± 83.1 MME vs. 168.3 ± 96 MME, p=0.02). In multivariable regression, CTU use was significantly associated with increased postoperative opioid consumption (p=0.05). There were significant improvements in ASES and DASH both groups by 3 months and 6 months respectively, but no difference between groups.

DISCUSSION AND CONCLUSION:

A standardized postoperative CTU regimen reduced opioid consumption following ARCR. Patients who used CTUs experienced lower VAS scores during the first postoperative week, with a significant difference on postoperative day 2. Patient-reported functional outcomes were not affected by CTU utilization.

Figure 1. Visual Analog Pain (VAS) scores in the early postoperative period from patient pain diaries



VAS, visual analog scale; POD, postoperative day

Figure 2. Mid-term postoperative changes in the American Shoulder and Elbow Scores (ASES), Disability of Arm, Shoulder, and Hand (DASH) and Visual Analog Scale (VAS) scores. Statistically significant change from preoperative score is indicated by the * at p<0.05.

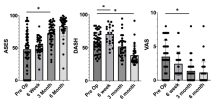


Table 1: Demographic characteristics

	Cold Therapy Group (n = 50)	Control (n = 51)	p-value
Age, mean (SD), yr	60.9 (12.93)	57.7 (10.8)	0.19
Sex, n			0.62
Female	25	22	
Male	25	29	
Laterality, n			0.47
Right	31	27	
Left	19	24	
Race, n			0.76
White	39	32	
Black	1	2	
Hispanic	4	5	
Asian	5	6	
Other	1	6	
Preoperative NSAIDs, n	18	15	0.35
Tear size			0.30
Small	20	21	
Medium	16	23	
Large	10	5	
Massive	4	3	
Tendon torn			0.59
Supraspinatus	36	40	
Infraspinatus	7	12	
Teres Minor	0	0	
Subscapularis	29	25	
Repair technique			0.43
Single row	29	33	
Double row/Transtendon	21	18	
Operating room time, mean (SD), min	88.8 ± 18.2	69.5 ± 15.8	0.98

SD, standard deviation; NSAID, nonsteroidal anti-inflammatory drug; Min, minutes. No statistically significant differences in patient demographic characteristics, between the Cold Therapy and control groups

Table 2: Preoperative and early patient reported outcomes

	Cold Therapy Group	Control	p-value
VAS pain score			
Preoperative	5.5 (2.4) n = 45		
6 weeks postoperative	2.4 (1.7) n=36	3.1 (2) n=49	0.38
3 months postoperative	1.3 (1.5) n= 43	1.8 (1.8) n=48	0.34
6 months postoperative	1.1 (1.6) n=41	0.9 (1.1) n= 41	0.52
ASES score			
Preoperative	57.8 (19.5) n= 40	57.8 (21.1) n=51	0.98
6 weeks postoperative	52.2 (22.7) n= 37	54.6 (19.3) n= 49	0.9
3 months postoperative	72.6 (16.3) n= 43	69.4 (18.2) n=45	0.25
6 months postoperative	83.6 (15.8) n=42	86.1 (12.2) n= 41	0.81
DASH score			
Preoperative	58.0 (14.6) n=40	62.6 (20.4) n=49	0.28
6 weeks postoperative	70.8 (17) n=22	-	
3 months postoperative	51.9 (15.3) n=31	-	
6 months postoperative	38.8 (14.8) n= 34	-	

n, number of patients included in analysis; VAS, visual analog scale; ASES, American Shoulder and Elbow Surgeons; DASH, Disabilities of the Arm, Shoulder and Hand

Table 3: Multivariable analysis of postoperative opioid use controlling for construct type, OR time, number of tendons torn, tear size, sex, race/ethnicity and CTU use

Independent variable	β value [95% CI]	p-value
Constant	-	-
Single row (ref)	-	-
Double row	51.06 [-10.82, 116.94]	0.10
OR time	0.49 [-1.11, 2.29]	0.58
Number of tendons torn		
One (ref)	-	-
Two	-0.81 [-68.71, 47.08]	0.88
Three	-16.25 [-109.65, 97.15]	0.47
Tear size		
Small (ref)	-	-
Medium	14.18 [-40.42, 80.98]	0.62
Large	-57.82 [-130.62, 35.98]	0.22
Massive	-50.00 [-192.16, 132.02]	0.71
Sex		
Male (ref)	-	-
Female	-35.75 [-85.35, 13.85]	0.16
Race/Ethnicity		
White (ref)	-	-
Black	-6.71 [-146.35, 90.95]	0.89
Hispanic	-1.27 [-108.45, 106.09]	0.98
Asian	-5.96 [-82.30, 69.98]	0.88
Other	-1.34 [-122.82, 120.14]	0.98
CTU	-50.83 [-99.65 , -0.41]	**0.05**

OR, operating room; CTU, cold therapy unit; ref, reference