

Cold Therapy in Lower Limb Amputation Revision Surgery

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Introduction

Cold therapy has traditionally been commonly applied in the management of acute soft tissue injuries. There are several potentially useful physiological effects, but there is a lack of evidence on the exact mechanism of action and clinical benefits [1-3]. There are no randomised control trials on its application in the post-operative setting and most of the published studies have been based on the use of crushed ice, ice-packs or other crude methods of skin cooling [3]. Three recent craniofacial surgical studies assessed the use of post-operative Hilotherapy, a system that uses a device that circulates sterile water into a conformable mask to allow a fixed temperature [4-6]. These generated mixed results, with two showing an improvement in facial swelling and pain [4,5] and one showing no improvement [6]. The aim of our current study was to determine whether using the hilotherapy system to modify skin temperature has any beneficial effects in lower limb amputation revision surgery.

Materials & Methods

We used the Hilotherapy system [insert model details, see diagram] post-operatively on 6 patients between March and May 2011. All patients were military and had elective revision surgery to bilateral above knee amputations. All patients had a general and regional anaesthetic, the latter placed under ultrasound guidance by experienced anaesthetists. Post-operative wound dressings of jelonet, gauze, velband and crepe were applied to all operated lower limb stumps. We added the 'Hilotherm cap' to these and dressed it with a final layer of crepe bandage. We set the temperature to cool (10°C) for the immediate post-operative 24 hours on one limb (generally the one with the larger wound) and used the other limb as a control, setting the Hilotherm up, but not turning it on (temperatures ranged 24-28°C). We then monitored the routine observations and recorded particularly the pain control (scored out of ten) and analgesia requirements.

Results

We assessed 6 patients, all male with military injuries that required elective revision stump surgery bilaterally. We found pain scores were acceptably controlled using conventional methods, but noted an improvement in patient perceived pain control on the limb actively cooled by the Hilotherm device both at 12 hours (-2.83 vs +0.33, P=0.0454) and 24 hours (-4.5 vs -2.17, P=0.0278) post-operatively.

Post-operative times (hours)	Patient limb pain scores (out of 10)											
	1		2		3		4		5		6	
cooled limb	L	R	L*	R	L*	R	L	R*	L	R*	L	R*
0	3	3	8	3	5	3	5	6	6	7	3	4
12	5	3	3	7	2	2	3	3	4	3	4	2
24	2	1	1	2	1	1	2	1	1	1	2	1

Pain score change 12hrs		Pain score change 24hrs	
cooled	control	cooled	control
-5	4	-7	-1
-4	-2	-6	-5
-3	-1	-4	-2
-3	-2	-5	-3
-2	1	-3	-1
0	2	-2	-1

average -2.833333333 0.333333333 -4.5 -2.166666667
students T-test scores: 0.045417721 0.027793195

Discussion

Based on our results from 6 military patients, who were all discharged from hospital uneventfully within 4 days of operation, we would tentatively encourage the use of the Hilotherm system, as described in our methods section above, and preferably as part of a trial, to aid in pain control for patients undergoing limb amputation surgery. To our knowledge this is the first data on the use of the Hilotherm system in limb surgery and our results would need to be confirmed with further studies with larger patient numbers. It would also be worthwhile testing whether these findings hold in the acute trauma setting (primary surgery, as apposed to elective revision surgery). Currently there is insufficient data to draw any conclusions on the post-operative benefits of cooling therapy, but based on our results and the fact the Hilotherapy system is easy to apply, very well tolerated by patients and side effect free, we would certainly advocate further use and study to define the exact analgesic equivalent (by measuring reduction in pharmacological analgesia) and any other benefits on inflammation, wound healing and rehabilitation.

References

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