

Impact of intercostal nerve cryoablation for aortic repair with left thoracotomy: decrease postoperative opioid use and encourage lung expansion



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Background – Post-thoracotomy pain

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REVIEW ARTICLE

Post-Thoracotomy Pain: Current Strategies for Prevention and Treatment

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- Left thoracotomy for aortic repair causes unbearable pain post surgery. Nevertheless, various analgesics were used.
- A multimodal approach, which included opioid use, epidural anesthesia, and costal nerve block, can result in decreased acute pain.





Background – Intercostal nerve cryoablation

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Intercostal nerve cryoablation therapy for the repair of pectus excavatum: a systematic review

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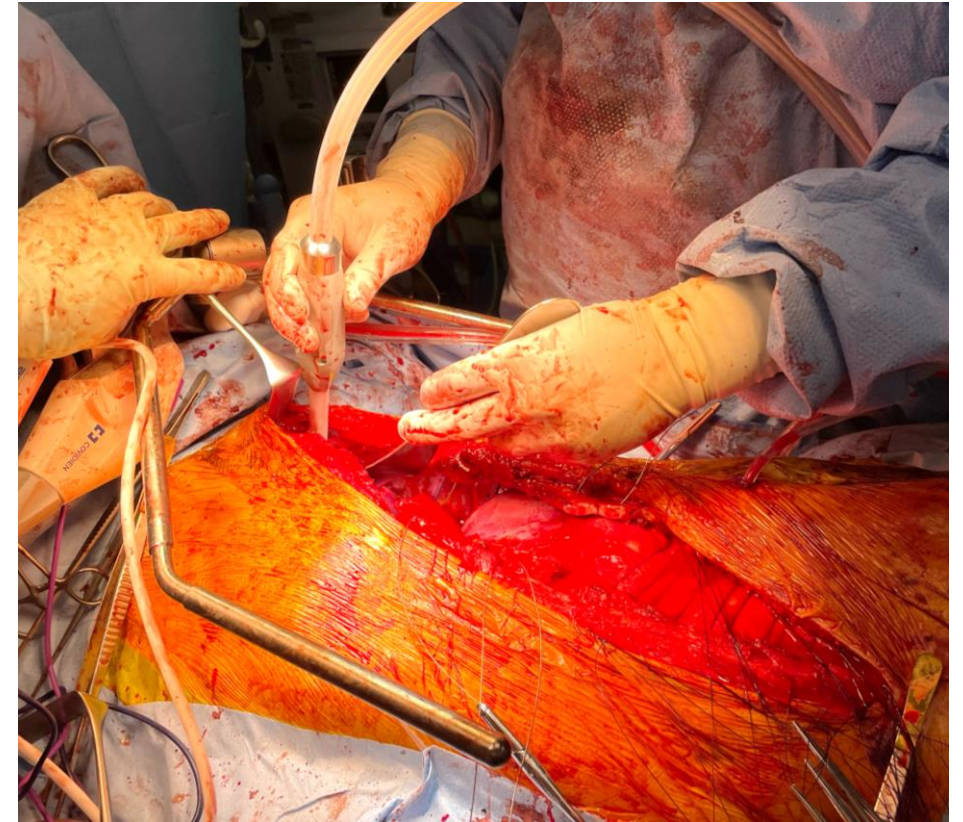
- Intercostal nerve cryoablation associated with a decreased hospital length of stay and opioid use in the pectus excavatum repair.





Purpose

- In this study, the impact of intercostal nerve cryoablation for pain management in patients who underwent aortic repair with left thoracotomy was evaluated.





Methods – Patients

2017 ~ 2022

**72 patients with
left thoracotomy
for TAAA or TAA
repair**

**62
patients**

**32 patients
Cryoablation**

**30 patients
Non-
cryoablation**

Exclusion

- ✓ **Emergency cases**
- ✓ **Infection cases**



Methods – Pain management

Common methods

- 4th~6th left thoracotomy with 20 to 30cm incision for aneurysm repair.
- Regular analgesics: acetaminophen or tramadol hydrochloride acetaminophen.
- Opioids were prescribed as needed.
- Epidural anesthesia was not used.

Cryoablation

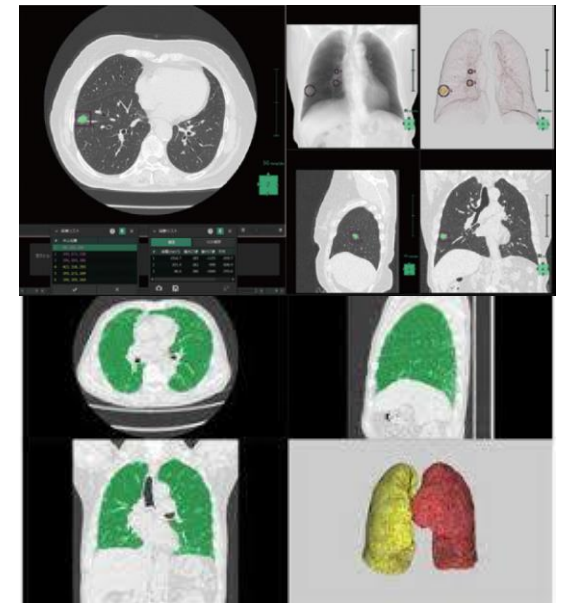
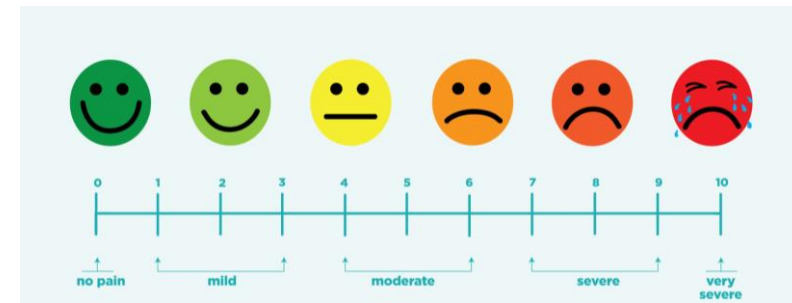
- Device: Freeze stick M: Type A (SHIRAIMATSU Corporation)
- Put the cryo-stick (-30°C to -90°C) on the intercostal nerve around the incision sites for 2 min after cryolesions were recognized.





Methods – Outcomes

- Pain evaluation: 1 to 10
 - ✓ A numerical rating scale was used.
- Number of cases of opioid use
 - ✓ Use a fentanyl patch depending on their pain.
- Assessment of lung expansion post surgery
 - ✓ Lung volume was evaluated by computed tomography.
 - ✓ 3D lung images were constructed using volume rendering.
 - ✓ Lung volume was automatically calculated by software.





Results – Patients characteristics

	Cryoablation N = 32	Non-cryoablation N = 30	p
Age	64.3 ± 14.8	61.2 ± 12.2	0.36
Male (%)	26 (81.2)	22 (73.3)	0.54
Body surface area (m²)	1.69 ± 0.16	1.74 ± 0.24	0.36
Euro score	6.1 ± 2.2	6.0 ± 2.0	0.82
Diabetes mellitus (%)	4 (12.5)	4 (13.3)	1.00
COPD (%)	15 (46.8)	11 (36.6)	0.45
Procedure – TAAA (%)	22 (68.7)	23 (76.6)	0.57
TAA (%)	10 (31.3)	7 (23.4)	0.57
Operation time (min)	295 ± 217	295 ± 186	0.97
Cardiopulmonary bypass time (min)	109 ± 84	100 ± 80	0.66

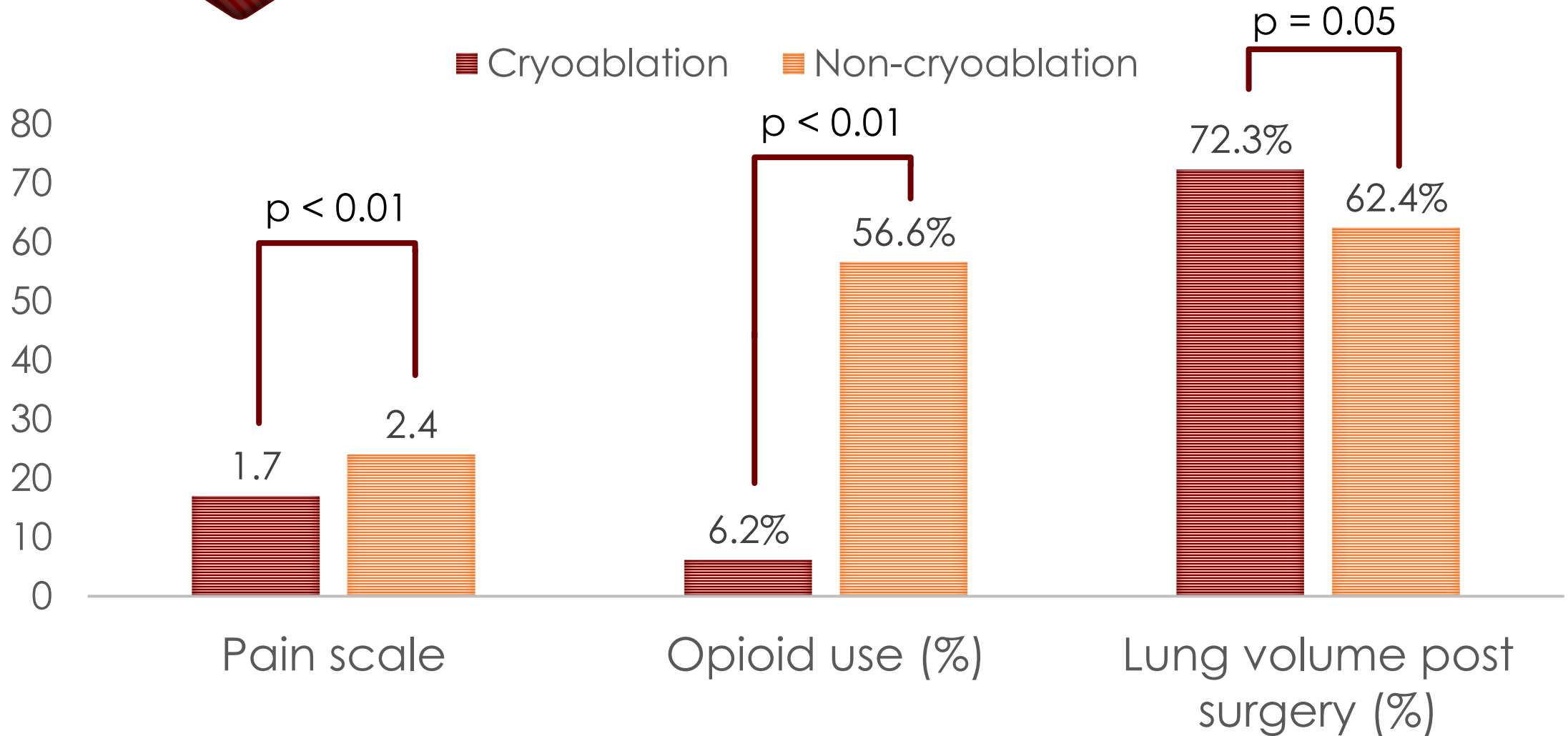


Results – Post surgery

	Cryoablation N = 32	Non-cryoablation N = 30	p
ICU stay (day)	1.8 ± 1.4	1.3 ± 1.0	0.17
Post surgical hospital stay (days)	24.8 ± 10.6	29.3 ± 17.2	0.22
Mechanical ventilation time (h)	19.8 ± 27.5	13.3 ± 17.0	0.27
Pain scale (1 - 10)			
Mean of day 1 post surgery	1.7 ± 1.0	2.8 ± 1.2	<0.01
Mean of days 1 - 5 post-surgery	1.7 ± 0.9	2.4 ± 0.8	<0.01
Opioids use (%)	2 (6.2)	17 (56.6)	<0.01
Lung expansion at 1 week post-surgery			
1 week – Bilateral lung ratio (%)	79.5 ± 17.2	73.6 ± 11.9	0.12
1 week – Left side lung ratio (%)	72.3 ± 21.1	62.4 ± 17.2	0.05



Outcomes





Conclusion

- Intercostal nerve cryoablation showed good pain management.
- This procedure decrease opioid use and encouraged lung expansion post-surgery.