Quality & Safety Control: Safe Application of Liquid Nitrogen in Limb Salvage Procedure

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Presentation No. (F-P4.41)
Our Challenges

- Use of intra-op Liquid Nitrogen (LN$_2$) in recycling resected tumor-bearing bone segment
- Firstly introduced by O&T Oncology Team, QMH in March, 2015
- Immerse resected bone in LN$_2$ (-196°C) for 20 mins, then perform reconstruction

Benefit of Limb Salvage Procedure
✓ Preserve limb – Prevent amputation
✓ Use auto-graft for reconstruction
✓ No rejection

Our Concerns for Safety & Quality Control

- How to retrieve the immersed bone from the container?
- How to pour LN$_2$ safely into the container?
- Proper Size of Sterile Container for fully immersion?
- How to maintain sterility?
- Ensure patient & staff safety
  - Aseptic Technique
  - OSH Guideline
  - Infection Control

Comply with principles
Methodology

• Before the very first LN$_2$ operation, we...

Site Visits

• Local
• Overseas: Japan

Team Approach

• O&T Surgeons
• OSH Team
• ICN
• OR Nurses

Testing

• Procedure Simulation

Set up In-house Guideline on Perioperative Safe Handling of LN$_2$
3 Perioperative Safety Issues

Preoperative
- Storage & Refill Safety
  - Dewar Tank
  - Oxygen Saturation Sensor & Alarm System
  - Automatic Exhaust System
- Caution Signs
  - Ensure vaporization in a ventilated & quarantined area

Intraoperative
- Intra-op Handling of LN₂
  - Ensure the graft is fully immersed
  - Maintain sterility by draping
  - Suitable Insulated Container
- Fishing Technique
- Strict Aseptic Technique
- On-going Assessment of LN₂ level
- Isolated Area Away from Patient
- Time Log for Preparation of LN₂

Postoperative
- Handling of LN₂ After Procedure
  - PPE to Protect Staff Safety
- Oxygen Alarm Repeater

Fishing Technique
Result & Outcome

• 5 LN$_2$ surgeries successfully performed with the in-house protocol established.
• No injury/ complication reported.
• Collaboration among our perioperative healthcare team is important.
• Trial run for every newly developed procedure is essential for protocol development.

Acknowledgement

Special thank to Dr. LAM Ying Lee, Consultant of the Orthopaedics & Traumatology Department, Queen Mary Hospital

Thank you!