Local heat preconditioning to prevent wound breakdown and skin necrosis: A translational study


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Disclosures

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The clinical problem

Ischaemically challenged tissue

Wound breakdown: up to 39% ¹

Skin flap necrosis: up to 54% ²

Surgical delay

[ Reinisch JF: Plast Reconstr Surg, 1974 ]
Surgical delay

Invasive and time-consuming

[Reinisch JF: Plast Reconstr Surg, 1974]
Tissue preconditioning as alternative

Application of supraphysiologic stress to tissue prior to surgery

- Maintenance of microcirculation
- Increase of ischaemic tolerance of the tissue
Tissue preconditioning as alternative

- “True” preconditioning (PC)
  - Ischaemic
  - “Remote” ischemic
    - [Przyklenk K et al: Circulation, 1993]
- Systemic pharmacological PC
  - Monophosphoryl Lipid A
    - [Harder Y et al.: Anesth & Analg, 2005]
  - Erythropoietin
    - [Harder Y et al: Surgery, 2009]
  - Ghrelin
- Local physical PC
  - Shock-wave
  - Cooling
    - [Yunoki M et al: J Neurosurg, 2002]
  - Heat
Study aim

Effectiveness of repetitive local heat preconditioning

Incidence of

- Wound break down
- Skin flap necrosis
Methods

1. Skin Sparing Mastectomy and immediate breast reconstruction
   - 25 patients:
     Local heat preconditioning
   - 25 patients:
     No preconditioning (control)

2. Reduction Mammaplasty (RMP)
   - 15 patients:
     Local heat preconditioning of one breast
     No preconditioning of the other breast (control)
Methods

[Hilotherm GmbH, Deutschland]
Methods

PC initiated 18 hours prior to surgery

Perfusion measurements

Skin flap necrosis? Wound breakdown?

43°C 43°C 43°C

30' 30' 30' 30' 30'

Mastectomy / Breast reduction

14 days

Local heat preconditioning & breast surgery
Results. Overall

- No burns were noticed

- Heat-induced hyperaemia completely vanished
  prior to surgery
Results: Skin Sparing Mastectomy

Skin perfusion

1 hour after mastectomy un-preconditioned

1 hour after mastectomy preconditioned

Results: Skin Sparing Mastectomy

Skin flap necrosis


Mean \*p < 0.05 vs. control
Results: Skin Sparing Mastectomy

Length of hospital stay

[ Days ]

Control

Heat PC

Mean ± SD  *p < 0.05 vs. control

Results: Reduction Mammaplasty

Wound breakdown

[Graph showing wound breakdown with Control and Heat PC categories]
Results: Reduction Mammaplasty

Wound drainage

[ ml/24hrs ]

Mean ± SD

Control

Heat-PC
Summary

Local heat preconditioning

- Can be translated into daily clinical surgery
- Increases perfusion in ischaemically challenged tissue
- Significantly decreases skin flap necrosis
- Reduces wound breakdown
- Reduces length of hospital stay
- Does not increase postoperative drainage
Conclusions

Local heat preconditioning in specific breast procedures

• Safe

• Simple

• Efficient

• Applicable briefly prior to surgery

• Cost-effective
Perspectives

Local heat preconditioning & breast surgery

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