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Introduction

Postsurgical oedema is a common source of pain and functional limitation.

A valid, reliable and easily applicable measurement tool would facilitate oedema evaluation following total knee arthroplasty (TKA) surgery.

Bioimpedance spectroscopy (BIS) could suit this need, as it allows specific evaluation of interstitial fluid and showed promising results for lymphoedema evaluation.

A pilot study found negligible influence of knee arthroplasty on bioimpedance measurements.

Purpose

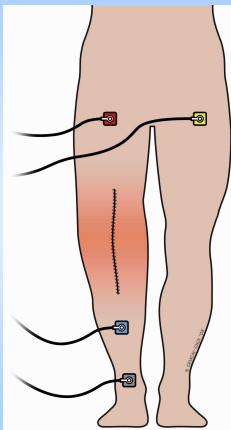
This study aims at assessing BIS measurement properties for oedema evaluation after TKA surgery.

Participants

24 patients undergoing TKA surgery, without other metallic implant, defibrillator or pacemaker.

Methods

BIS and volume measures were taken at pre-surgery D-1, post surgery D2 and D8. Two investigators performed two BIS measurements alternatively (Impedimed SFB7, Queensland, Australia). Percentage difference between healthy and involved limb were respectively calculated for BIS at a frequency equal to zero (R0), representative of interstitial fluid, and for volume determined by circumferential tape measurements at 4 cm intervals.



Results

Reproducibility

Intra-evaluator correlation coefficient > 0.98 at PO, D2, D8.
Inter-evaluator correlation coefficient > 0.97 at PO, D2, D8.
Mean difference between evaluators $< 0.46 \Omega$, limits of agreement -3.59 to 2.95Ω .

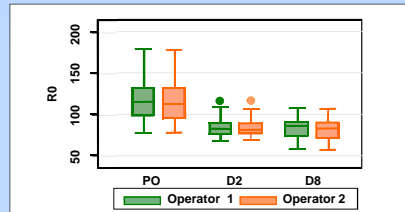


Fig. 1 : dispersion of BIS measures for 2 operators at each stage.

Responsiveness

Effect size between D-1 and D2 were **4.49** for BIS and **2.23** for volume measurements.

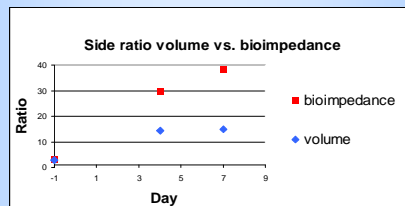


Fig. 2 : BIS (red) and volume (blue) mean values at D-1, D2 and D8 for the operated leg.

Validity

Correlations between BIS and volume reached **0.71** at D-1 ($p < 0.05$), **0.61** at D2 ($p < 0.05$) and **0.33** at D8 (N.S.) respectively.

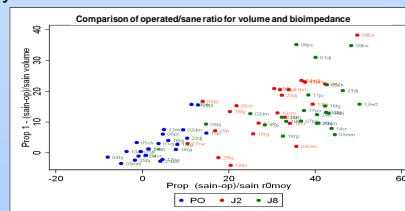


Fig 3 : relation between R0 ratio and volumes ratio at each stage.

Discussion / Conclusion

Intra- and inter- evaluator reproducibility are excellent. Responsiveness is better for BIS than for volume.

Correlation decrease at D8 is partly due to healthy side variability. It is thus advisable to use involved side that contralateral side as a reference during follow up. Muscular atrophy may bias volume measurement or change in fluid composition may alter BIS.

Bioimpedance is a reliable and responsive tool for oedema follow up after TKA surgery.

Implications

BIS allows reliable and responsive oedema evaluation at patient's bedside after TKA surgery. Further research is needed to precise relationship between BIS and volume.

References

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