Onodera's Prognostic Nutritional Index: A Valuable Measure in Predicting Complications After Total Knee Arthroplasty

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Introduction

- Total Knee and Hip Arthroplasty utilization continues to increase

- By year 2030
  - Primary Total Knee Arthroplasty (TKA) estimated to increase 85% to 1.26 million procedures/year
  - Primary Total Hip Arthroplasty (THA) estimated to grow 71% to 635,000 procedures/year

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Sloan M, Premkumar A, Sheth NP. Projected Volume of Primary Total Joint Arthroplasty in the U.S., 2014 to 2030. J Bone Joint Surg Am 2018;

Complications

- Prosthetic joint infection (PJI)
  - Most common cause of revision TKA in Medicare population
  - 1.55% within 2 years, 0.46% at 2-10 years
- Pre-existing medical comorbidities significant risk factor for PJI
  - Obesity, diabetes, smoking, immunosuppression, malnutrition

https://upload.orthobullets.com/topic/5004/images/f1.large.jpg

Kurtz et al., 2010 *Clin Orthop Relat Res*
Hanada et al., 2020 *J Orthop Sci*

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Preoperative Optimization

- Hemoglobin A1C 7.7% indicative of increased PJI risk
- Fructosamine: measure of glycosylated serum proteins (normal 190-285 µmol/L)
  - Half-life of 2-3 weeks
  - Fructosamine >293 µmol/L associated with 11x higher risk of PJI
- Malnutrition (albumin < 3.5 g/dL) associated with PJI after primary and aseptic revision TJA
- Preoperative ESR/CRP has been evaluated as potential PJI predictor
- The best marker for assessing nutritional status remains unknown

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Tarabichi et al., 2017 *J Arthroplasty*
Shohat et al., 2019 *Bone Joint J*
Bohl et al., 2016 *J Arthroplasty*
Godoy et al., 2016 *Ochsner J*

Onodera's Prognostic Nutritional Index (OPNI)

- 10 x [serum albumin (g/dL)] + [0.005 x lymphocyte count (/mm^3)]
- Associated with mortality in colorectal cancer surgery, complication risk in spine surgery
- Lower OPNI associated with postoperative wound complications in TKA

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Ushirozako et al., 2021 *European Spine Journal*
Jian-Hui et al., 2020 *Tumor Biology*
Hanada et al., 2021 *J Orthop Sci*

https://web.musc.edu/-/sm/enterprise/resources/health-and-wellness/wellness-center/student-wellness/i/main-nutrition-and-diet.ashx

Study Aim

- Investigate the utility of Onodera's Prognostic Nutritional Index in predicting early complications following TKA

- Determine threshold at which risk of complications increases significantly

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Methods

- Prospective, multi-center study
- OPNI measured within 14 days of TKA
- Complications assessed for 12 weeks postoperative, including:
  - PJI
  - Wound complications
  - Re-admission
  - Re-operation
- Younden's Index to determine cutoff values for OPNI and albumin
- Multiple regression model using Charlson Comorbidity Index

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Results

1325 patients

763 female

562 male

OPNI cutoff of 45.1 determined as optimal threshold associated with complications

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Results

- Lower OPNI (<45.1) associated with:
  - 9.8 times more likely to develop PJI than OPNI ≥ 45.1 (p=0.001)
  - 4.6 times higher readmission rate (p=0.017)
  - 4.2 times higher reoperation rate (p=0.005)

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Results

- Complications remained statistically significant after multiple regression analysis
- Unlike OPNI, albumin failed to show a significant association with complications (cutoff 3.82 g/dL)

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Limitations

- Short-term follow up
- Substratification needed to identify potential effects of lymphocyte count vs albumin levels on OPNI, complications

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Conclusion

OPNI is a valid and an excellent predictor of complications following TKA. It better reflects the nutritional status, has greater predictive power for complications, and can determine whether the body is in anabolic or catabolic status.

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Conclusion

Based on these findings, we recommend screening all patients undergoing TKA using OPNI; for those with OPNI <45.1 the risk of surgery should be carefully weighed against its benefit and nutritional optimization should be considered

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