

Soft-tissue Hypertrophy And Redundant Plications Evaluated for their Impact on Postoperative Infection in Total Knee Arthroplasty

John Green, MD¹; Cale Dobson, BS²; Jacob Elkins, MD, PhD³

¹Creighton University Department of Orthopedics, ²University of Iowa Carver College of Medicine, ³University of Iowa Department of Orthopedics and Rehabilitation

Presenting author: Jacob Elkins, jacob-elkins@uiowa.edu

Disclosures: J. Green: None. C. Dobson: None. J. Elkins: 3B; Depuy Synthes. 5; Depuy Synthes, IronMind. 8; Journal of Arthroplasty, Journal of Orthopedic Research, Journal of Biomechanics, Journal of Bone and Joint Surgery, Clinical Orthopedics and Related Research, Clinical Biomechanics, PLOS One.

Introduction: Obesity is a risk factor for prosthetic joint infection (PJI) in patients undergoing total knee arthroplasty (TKA) but may be an imprecise measure of a multitude of factors. Bioimpedance analysis provides a more detailed overview of a patient's body composition; however, such devices are often inaccessible and expensive. Radiographs, however, are universally obtained before joint replacement. The purpose of this study is to relate the number of skin folds seen on radiographs to PJI and variables from bioimpedance analysis.

Methods: The number of skin folds on anteroposterior (AP) standing knee and long leg radiographs were retrospectively assessed for 616 patients who underwent TKA from December 2020 to December 2023 and who had bioimpedance data available. This was related to demographic and clinical variables including: age, gender, chronic kidney disease (CKD) status, diabetes (DM) status, American Society of Anesthesiologists (ASA) class, Charlson Comorbidity Index (CCI), and PJI rate as well as bioimpedance data including: body mass index (BMI), body fat percentage (BFP), as well as markers of lymphedema such as extracellular water to total body water ratio (ECW/TBW) and phase angle. T-tests were used for continuous variables and Chi-squared for categorical variables.

Results: Greater than or equal to 4 skin folds on AP knee x-ray (XR) was significantly correlated with PJI (9.6% vs. 2.3%, $p < 0.0001$). Skin folds on the AP knee XR were also significantly correlated with a higher BMI (39.5 kg/m² vs. 34.1 kg/m², $p < 0.0001$), BFP (48.9% vs. 40.2%, $p < 0.0001$), ECW/TBW total (0.400 vs 0.394, $p < 0.0001$), ECW/TBW of the operative leg (0.405 vs 0.400, $p < 0.0001$) and lower whole body phase angle (4.31 vs 4.82, $p < 0.0001$).

Discussion: Four or more skin folds on AP knee radiographs is a risk factor for PJI in patients undergoing TKA. This radiographic sign may also be used as a surrogate for excessive lymphedema, an increasingly known risk factor for postoperative complications. Limitations of this study include its retrospective nature and the relatively small sample size.

Significance/Clinical Relevance: Total knee arthroplasty is one of the most common orthopedic procedures performed. One of the most morbid complications is infection. This novel XR sign may help clinicians identify patients with a higher risk of infection and as a surrogate for more expensive BIA.

Figure 1: Example of four skin folds counted on a standing AP radiograph of the knee.

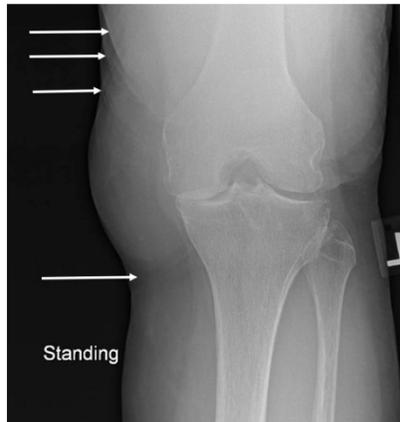


Table 1: Skin folds versus prosthetic joint infection

		Skin Folds <4	Skin Folds >/=4	p
PJI*				0.003
	No (%)	551 (97.7)	47 (90.4)	
	Yes (%)	13 (2.3)	5 (9.6)	
*Prosthetic joint infection				

Table 2: Skin folds versus body composition data

	Skin Folds <4	Skin Folds >/=4	p
Body Mass Index	34.1	39.5	<0.0001
Fat %	40.2	48.9	<0.0001
phase angle	4.82	4.31	<0.0001
ECW/TBW Total*	0.394	0.4	<0.0001
ECW/TBW (operative leg) *	0.4	0.405	<0.0001
*Extracellular water/total body water			