Vitamin D_3 Supplementation Prior to Total Knee Arthroplasty: A Randomized Controlled Trial

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INTRODUCTION:

Vitamin D deficiency has been associated with worse outcomes following total knee arthroplasty (TKA). The purpose of this randomized controlled trial was to determine if a one-time dose of vitamin D_3 prior to TKA improves function and patient-reported outcomes, while decreasing complications.

METHODS:

107 Patients undergoing primary TKA were prospectively randomized to receive 50,000 international units (IU) vitamin D_3 (57 patients) or placebo (50 patients) on the morning of surgery. Patients were excluded if already taking Vitamin D_3. An *a priori* power analysis determined 45 patients were required in each cohort to detect a minimal clinically important difference of six points in the functional component of the 2012 version of the Knee Society Score (KSS), assuming an alpha of 0.05, power of 80%, and standard deviation of 10 points. The KSS and Timed Up and Go Test (TUGT) were measured preoperatively and at three and six weeks postoperatively. Complications within 90 days postoperatively were recorded. Changes in KSS and TUGT were analyzed using linear mixed effects models, with alpha <0.05.

RESULTS:

There was no difference in improvement of KSS at three weeks (+4.8 points vitamin D_3 vs. +3.0 points placebo; p=0.58) or six weeks (+14.5 points vitamin D_3 vs. +12.4 points placebo; p=0.51) from baseline. There was no difference in change in TUGT at three weeks (+1.2 seconds vitamin D_3 vs. +0.6 seconds placebo; p=0.55) or six weeks (-0.3 seconds vitamin D_3 vs. -0.9 seconds placebo; p=0.61) from baseline. There were four complications in the placebo cohort and five complications in the vitamin D_3 cohort (p=1.00).

DISCUSSION AND CONCLUSION:

Supplementation with 50,000IU vitamin D_3 on the morning of TKA failed to demonstrate significant differences in functional KSS, TUGT, or complications in the early postoperative period compared to placebo. Future studies should evaluate different dosing regimens, including larger one-time vitamin D_3 doses.

Table 1: Patient Demographics

	Placebo	Vitamin D_3	P-Value
n	50	57	
Mean Age, yrs (SD)	64.5 (8.5)	63.7 (9.5)	0.680
Sex, n (%)			0.747
Male	23 (46.0)	28 (49.1)	
Female	27 (54.0)	29 (50.9)	
Mean BMI, kg/m^2 (SD)	34.1 (6.0)	33.7 (7.1)	0.798
ASA, n (%)			0.081
2	37 (74.0)	33 (57.9)	
3	13 (26.0)	24 (42.1)	
Laterality, n (%)			0.577
Left	21 (42.0)	27 (47.4)	
Right	29 (58.0)	30 (52.6)	

Table 2: Postoperative Outcomes

Outcome	Placebo	Vitamin D_3	P-Value
KSS Score			
Baseline	43.8	46.2	0.490
3 Week, versus baseline	+3.0	+4.8	0.577
6 Week, versus baseline	+12.4	+14.5	0.511
TUGT, seconds			
Baseline	12.9	12.6	0.747
3 Week, versus baseline	+0.6	+1.2	0.553
6 Week, versus baseline	-0.9	-0.3	0.609
Complications, n (%)			1.000
Yes	4 (8.0)	5 (8.8)	
No	46 (92.0)	52 (91.2)	

Table 3: Occurrence of the Knee Society Standardized List of Complications 90 Days Postoperatively

Knee Society Complication	Details	Allocation
Readmission	Cellulitis unrelated to surgical site	Placebo
Readmission	Gastrointestinal bleed	Placebo
Deep periprosthetic joint infection	Periprosthetic joint infection	Placebo
Readmission	Atrial fibrillation and pulmonary embolism	Placebo
Readmission	Urinary retention	Vitamin D_3
Wound Complication	Cellulitis	Vitamin D_3
Extensor Mechanism Disruption	Extensor mechanism disruption	Vitamin D_3
Deep periprosthetic joint infection	Periprosthetic joint infection	Vitamin D_3
Death	Cardiac arrest 5 weeks postoperatively	Vitamin D_3