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Impact of Unilateral and Bilateral Total Knee Arthroplasty for Bilateral Osteoarthritis on Postoperative Fracture Risk

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Faculty Disclosure Information

- My disclosure is
  - Paid Consultant: Zimmer Biomet

Osteoarthritis of the knee (OA) has a high risk of vertebral and non-vertebral fractures despite high bone mineral density in the proximal femur and lumbar spine *Bergink et al, 2003* [1)]

The association between knee OA and hip fracture remains unclear
Chudyk et al, 2012 [2)] *, Zhang et al 2023* [3)]

Aim of this study

To investigate the effect of unilateral and bilateral total knee arthroplasty (TKA) on postoperative fracture risk in patients with bilateral OA

Patients

497 cases： Underwent TKA between July 2007 and Dec 2017
Preop OA ≥ Grade 3 in K-L classification bilaterally
Follow up ≥ 3 years after first TKA

Exclusion criteria:	Revision, RA, surgery in other hospital
Age (year-old):	74.4±6.9
Sex:	M : F = 84 : 413
Follow up period (M):	76.3±28.2 (≥ 36)

Unilateral TKA	186 cases
Bilateral TKA	311 cases including 65 of single stage surgery

Survey items

- Postoperative fractures
- Fracture site
- Knee treatment status (unilateral or bilateral TKA) at the fracture
- Treatment for osteoporosis

Results: Postoperative fracture (n=497)

Fracture:	105 cases (21.1%)
Multiple fractures	25 cases (5.0%)

Fracture site (108 fractures in 105 cases)

Vertebral	41 (8.2%)
Non-vertebral	67 (13.5%)
Upper limb	*10*
Lower limb	*41*
Trunk	*16*

Postoperative fracture & Knee treatment status (unilateral / bilateral)

	Unilateral TKA (n=203)	Bilateral TKA (n=294)	
Postoperative fracture	53 (26.1%)	52 (17.7%)	p = 0.024*
Age at the first fracture ±S.D.	75.4±6.2	75.7±6.0	n.s.**
Gender (M : F)	1 : 52	3 : 49	n.s.***
BMI ±S.D.	25.2±3.9	25.6±3.5	n.s.**
Period after the first TKA (M)	42.6±32.7	50.8±31.7	n.s.**

* chi-square test
** Welch's t-test
*** Fisher's exact probability test

Fracture site & Knee treatment status (unilateral / bilateral)

	Unilateral TKA (n=203)	Bilateral TKA (n=294)	
Vertebral	19 (9.4%)	22 (7.5%)	n.s. *
Non-vertebral	37 (18.2%)	30 (10.2%)	p=0.01 *
Upper limb	5	5	n.s. **
Lower limb (hip)	22 (12)	19 (8)	n.s. *
Trunks	10	6	n.s. *
Multiple fractures	16 (7.9%)	9 (3.1%)	p=0.02 *

* chi-square test

** Fisher's exact probability test

Preoperative Treatment for osteoporosis

17 / 497 cases (3.4%)

10 / 105 (9.5%) cases in postoperative fracture patients

Treatment of osteoporosis (+)	Unilateral TKA (n=53)	Bilateral TKA (n=52)	
Postoperative fracture	6	4	n.s.*

* Fisher's exact probability test

Discussion; Knee OA & Fracture risk

	Rotterdam study (OA ≥ K-L G2) n=7983 Ave. age :70.6 y.o. Female≒60%		This study (OA ≥ K-L G3) n=497 Ave. age: 74.4 y.o. Female≒80%	
	Knee OA(+)	Knee OA(-)	Unilateral TKA	Bilateral TKA
Vertebral fracture (%)	8.1 *	4.5	9.4	7.5
Non-vertebral fracture (%)	10.5 *	6.0	18.2 *	10.2

* $p<0.01$, chi-square test

Significantly higher risk of non-vertebral fractures in patients with knee OA ≥ K-L G3 after unilateral TKA

Causes of fractures in knee OA patients

- Osteoporosis with deterioration of bone quality in knee OA patients ;

  Saito et al, 2020 [4)]

  →Evaluation of osteoporosis and adequate treatment
- Increased risk of falls due to knee pain and imbalance

  Chudyk et al, 2012 [2)] *, Zhang et al 2023* [3)]

  →Evaluation of pain and balance

  →Contralateral TKA is expected to reduce the risk of falls

Conclusions

- The effect of unilateral and bilateral TKA on postoperative fractures was investigated in 497 patients with bilateral knee OA.
- The risk of fractures, especially non-vertebral fractures, is significantly reduced in the bilateral TKA group to the unilateral TKA group.
- Only 3.4% of patients for TKA were treated for osteoporosis, and proper evaluation and adequate treatment are important.
- Contralateral TKA should be considered for the patients with severe pain in contralateral knee or unstable ambulation after unilateral TKA.

References

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