



Is the cause of femoral neck fracture after total knee arthroplasty iatrogenic or stress fracture?

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ABSTRACT

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Due to the increase in life expectancy, the number of patients with knee osteoarthritis in the society is increasing as well. Treatment options for the early-stage knee osteoarthritis include nonsteroidal anti-inflammatory drugs, intra-articular injections and physical therapy modalities. In patients with advanced stage of osteoarthritis and clinical complaints, by virtue of the advances in surgical experience and implant production, knee arthroplasty becomes more successful and durable. Despite the innovations in implant technology and surgical treatment methods, complication rate increases due to hypertension (HT), osteoporosis (OP) and diabetes mellitus (DM). In this paper, a 67-year-old female patient with femoral neck fracture that was identified 6 months after a total knee arthroplasty performed due to the knee osteoarthritis was discussed in the light of literature.

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1. Introduction

Knee osteoarthritis is a widely encountered joint disease which causes mild and intermittent pain initially but continuous and unbearable pain in advanced stages and thus impeding the ability to live independently. Treatment options for the early-stage knee osteoarthritis include nonsteroidal anti-inflammatory drugs (NSAIDs), intra-articular injections and physical therapy modalities. In patients with advanced stage of osteoarthritis and clinical complaints, total knee arthroplasty (TKA) is a widely used option which gives successful outcomes. With the increases in elderly population, the number of TKA is increasing continuously as well (Çakmak et al., 2012). These patients frequently have additional health problems such as diabetes mellitus (DM), hypertension (HT), and osteoporosis (OP) and less ability to move at advanced ages. Due to the aforementioned reasons, wound-healing problems, deep vein thrombosis (DVT), infection, loosening

and periprosthetic fractures are more frequently encountered (Sharkey et al., 2002). Case of femoral neck stress fracture following TKA has been rarely reported.

In this case report, a 67-year-old female patient with femoral neck fracture that was identified six months after a total knee arthroplasty performed due to the knee osteoarthritis was discussed in the light of literature.

2. Case presentation

A 67 year-old female patient diagnosed with osteoarthritis of the right knee underwent TKA three years ago and revision TKA one year ago due to aseptic loosening. The patient was examined by reason of the onset of the complaints in the left knee and advanced stage osteoarthritis was identified and the patient underwent TKA (Fig 1). The patient was allowed to walk with the help of a walker on the first postoperative day and discharged from the hospital on the fifth day. At the third

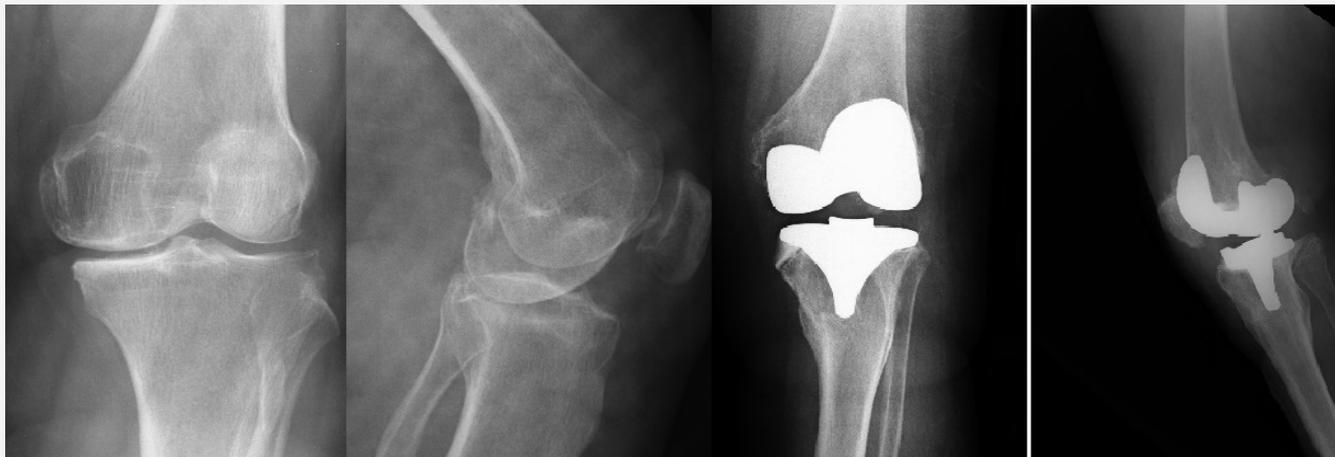


Fig. 1. Osteoarthritis of the knee and post-operative appearance

month control, the patient had mild pain in the knee and was able to walk with the help of a walker. At the fifth month control of the patient, it was understood that the complaints started 2-3 weeks after TKA and gradually increased, the patient was able to walk with the help of a walker only and could not give full load to her hip and experienced increased claudication. In the examinations, femoral neck fracture was identified and the patient underwent cementless bipolar hemiarthroplasty (Fig 2). No postoperative complications were observed in the follow-up period of one year.

3. Discussion

TKA due to osteoarthritis of the knee is being performed increasingly (Çakmak et al., 2012). Despite the advances in the production of implants and surgical treatments, because of its use in HT, DM and OP, complications are also increasing. Problems such as infection, movement restriction, periprosthetic fractures and loosening are more common after TKA (Sharkey et al., 2002). Fractures of ischium pubis, subtrochanteric femur, proximal tibia and femur neck fractures can be seen after total knee arthroplasty (McElwaine and Sheehan, 1982; Smith and Henke, 1988; Petje and Landsiedl, 1997; Thienpont et al., 2000; Çakmak et al., 2012).

Hardy et al. (1992) reported femoral neck fracture occurring in the late stage following TKA as a stress fracture resulting from unequal load distribution after TKA and

osteoporosis after the use of steroids. Several reports have considered this as a stress fracture due to different risk factors. Joshi et al. (2005) suggested that stress fractures result from excessive load exposure in the anterior cortex of the femoral neck due to extreme changes of mechanical axis after TKA in patients with advanced deformity. Hendel et al. (2001) identified a femoral neck fracture in one patient in the sixth month following TKA and performed cementless bipolar hip arthroplasty. Osteoporosis was considered as the underlying factor for fractures. Atalar et al. (2008) reported a femoral neck fracture developed after revision arthroplasty due to infection as a stress fracture occurring after two months of immobilization before the revision. Pankaj et al. (2007) identified displaced and non-displaced femoral neck fractures in one patient who underwent bilateral TKA after 9 months and reported no risk factors. All these factors have been considered as predisposing factors for stress fracture of the femoral neck but there is no conclusive evidence that any of them is the cause of the fracture. Additionally, iatrogenic intraoperative acetabulum fractures in total hip arthroplasty have also been reported (Sermon et al., 2008). Iatrogenic femoral neck fractures during intramedullary nailing performed in femoral diaphysis and proximal region fractures have also been reported (Khan et al., 1995).

Femoral and tibial implants are made with the help of implant apparatus used in TKA and cemented or cementless implants are placed by using a hammer after obtaining soft tissue balance and stabilized. In the meantime, uncontrolled force is applied to the femoral neck, but this reality was ignored in the reports. All the publications focus on the risk factors and indicated that the fracture occurs after surgery. However, due to the lack of early postoperative images, it is not clear whether this fracture occurs during surgery or in the postoperative period.

In our case, there are two risk factors namely the use of crutches due to the bilateral knee complaints before TKA and osteoporosis. Having undergone TKA three years ago and not being fully mobilized due to the revision surgery which was performed one year ago and being in weak and postmenopausal period are the risk factors for osteoporosis. Having no history of trauma has suggested a stress fracture.

Ten publications associated with TKA and presenting stress fractures were reviewed (Table 1). Of these, seven were postoperative femoral neck stress fractures (FNSF).



Fig. 2. Femoral neck fracture and postoperative direct radiography

Table 1. Stress fractures of the femur and tibia following total knee arthroplasty

Literature	Case number	Period between TKA and fracture (month)	Age (year)	Risk factors	Explanations
Çakmak et al (2012)	1 (Bilateral)	36	82	Immobilization Deformity Osteoporosis	Primary TKA
Atalar et al. (2008)	1	1	75	Immobilization Osteoporosis HT DM	Revision TKA
Pankaj et al. (2007)	1 (Bilateral)	9	55	Deformity Osteoporosis	Primary TKA
	1	9	75	Deformity Osteoporosis	Primary TKA
Joshi et al. (2005)	1	6	61	Immobilization Deformity RA	Primary TKA
	1	10	70	Deformity	Primary TKA
	1	6	78	Deformity Osteoporosis	Primary TKA
Rawes et al. (1995)	3	1-3		Deformity	Primary TKA
Hardy et al. (1992)	1	12	76	Deformity Osteoporosis	Primary TKA
Fipp (1988)	2	7		Deformity Osteoporosis	Primary TKA
McElwaine and Sheehan (1982)	1	4	66	Steroid RA	Primary TKA
	1	16	70	Deformity Steroid RA	Primary TKA
	1	6	53	Osteoporosis RA	Primary TKA
	1	3		Osteoporosis	Primary TKA
	1	7		Osteoporosis	Primary TKA
	1	15		Steroid	Primary TKA
	1	4	70	Steroid	Primary TKA Tibia stress fracture
	1	4	61	Deformity	Primary TKA Subtrochanteric fracture
Kumm et al. (1997)		1			
Petje et al. (1997)	1	2 (weeks)	63	Deformity Osteoporosis	Primary TKA Tibia shaft fracture

*TKA: Total knee arthroplasty; HT: Hypertension; DM: Diabetes mellitus; RA: Rheumatoid arthritis

In seven case reports of FNSF, 21 femoral neck stress fractures of a total of 19 patients after TKA have been reported. One was subtrochanteric femoral stress fracture. Tibial diaphysis stress fractures have been reported in two patients. The diagnosis in these patients was established after clinical examinations in postoperative period ranging from two weeks to 36 months. All were considered as stress fractures and treated. Fourteen of 19 patients were diagnosed with FNSF after TKA in postoperative period ranging two weeks and six months and all the patients were treated. Except for one case, early postoperative imaging of the hip was not performed. All had one or more risk factors such as mechanical axis disorder, steroid use, rheumatoid arthritis and osteoporosis. These fractures resulted from several reasons including postoperative mechanical axis changes, osteoporosis and mobilized life styles (Table 1). Although all of these fractures have been reported as stress fracture in these articles, iatrogenic fractures were ignored. Due to the

risk factors described above, much attention should be paid in femoral neck traumas and it should be noted that the use of uncontrolled force during implant placement may lead to the formation of non-displaced fractures.

Despite having only one case and insufficient postoperative imaging, no early stage imaging that would eliminate iatrogenic fracture in stress fracture cases is available. All the patients were in risk group, some could not be fully mobilized in the early period and the fractures were identified after mobilization. In late mobilized patients, the diagnosis of intraoperative fractures may be delayed.

4. Conclusion

It's thought that examination of the patients especially those in risk group and have pain in the hip region after TKA via radiography, computed tomography, magnetic resonance imaging and bone scintigraphy in early and late postoperative period would be more convenient.

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