

# End-stage renal disease affect mortality of hip fractures treated with partial hip prosthesis in the elderly

## Son dönem böbrek yetmezliği parsiyel kalça proteziyle tedavi edilmiş kalça kırığı olan yaşlı hastalardaki mortaliteyi etkiler

Mesut TAHTA<sup>1</sup>, Eyüp Çağatay ZENGİN<sup>1</sup>, Cem ÖZCAN<sup>1</sup>, Tahir ÖZTÜRK<sup>1</sup>, Tuğrul BULUT<sup>1</sup>, Muhittin ŞENER<sup>1</sup>

### ABSTRACT

Hip fractures are among important causes of mortality. Various comorbid factors contribute to this outcome. The end-stage renal failure (ESRF) is an extremely important factor leads to serious complications. When the presence of other comorbid diseases is taken into consideration, the relationship between mortality of hip fractures and end-stage renal disease was not well elucidated in the elderly population. The aim of this study was to determine the association between hip fracture mortality and end-stage renal disease. An evaluation was made of the data of patients with diagnosis of hip fracture. Current status of survival or date of death was determined. Patients were evaluated as cases with (Group 1: n=37), and without (Group 2: n=281) end-stage renal disease. Both groups were retrospectively compared regarding the age, female/male ratio, cardiac ejection fraction, bone cement usage, total hospitalization time, time from initial trauma to surgery for surgical preparation and mortality. There were additional comorbid diseases except renal disease. Besides the comorbidities were categorized as cardiac / pulmonary / neurologic and diabetes mellitus and both study groups were compared based on comorbid disease groups. There were no significant differences with respect to age ( $p=0.782$ ), female: male ratio ( $p=0.659$ ), ejection fraction ( $p=0.285$ ), bone cement usage ( $p=0.971$ ), duration of surgery ( $p=0.758$ ), cardiac ( $p=0.570$ ), pulmonary ( $p=0.875$ ), and neurologic comorbidities ( $p=0.895$ ) between two groups. A statistically significant relationship was found between both groups with respect to total hospitalization period ( $p<0.001$ ), time from trauma to surgery ( $p<0.001$ ), mortality ( $p=0.009$ ) and diabetes mellitus ( $p=0.043$ ). End-stage renal disease with diabetes mellitus increases mortality of hip fractures in the elderly independent from the presence of other comorbidities. These patients have a longer period of total hospitalization and surgical preparation time.

**Keywords:** End-stage renal disease, elderly, hip fracture, mortality

### ÖZ

Yaşlılarda kalça kırıkları, önemli mortalite nedenlerinden biridir. Çeşitli komorbid faktörler bu sonuca katkıda bulunur. Son derece önemli bir komorbid faktör olan son dönem böbrek yetmezliği (SDBY), ciddi komplikasyonlara neden olur. Bununla birlikte, diğer komorbid hastalıkların varlığı göz önünde bulundurulduğunda, SDBY'nin tek başına mortaliteye etkisi halen netlik kazanmamıştır ve bu çalışmada bu ilişkinin değerlendirilmesi amaçlanmıştır. Kalça kırığı tanısı ile kliniğimize başvurup parsiyel kalça artroplastisi ile tedavi edilmiş olan 65 yaş ve üstü hastalar retrospektif olarak değerlendirildi. Tüm hastalarla temasa geçildi. Ölüm meydana gelmiş ise tarihi kaydedildi. Hastalar kırık oluşumundan önce tanı koyulmuş SDBY'si olan (Grup 1, n=37) ve olmayan (Grup 2, n=281) olmak üzere 2 grupta değerlendirildi. Her iki gruptaki hastalar ortalama yaş, cinsiyet, kardiyak ejeksiyon fraksiyonu (EF), toplam hastanede kalış süresi, hastaneye yatıştan ameliyata kadar geçen süre, ameliyat süresi, çimento kullanımı ve mortalite parametreleri açısından karşılaştırıldı. Ayrıca komorbid hastalıklar kategorize edilerek kardiyak, pulmoner, nörolojik komorbid hastalıklar ve diabetes mellitus (DM) gruplarına ayrıldı. Her iki grup ek hastalık kategorileri açısından karşılaştırıldı. Yaş ortalaması ( $p=0.782$ ), cinsiyet ( $p=0.659$ ), EF ( $p=0.285$ ), çimento kullanımı ( $p=0.971$ ) ve ameliyat süresi ( $p=0.758$ ) açısından gruplar arasında anlamlı fark yoktu. Gruplar arasında toplam hastaneye yatış süresi ( $p<0,001$ ), ameliyat olana dek geçen süre ( $p<0,001$ ) ve mortalite ( $p=0,009$ ) açısından anlamlı fark belirlendi. Komorbid faktörlere göre grupların karşılaştırılması sonucunda kardiyak ( $p=0,570$ ), pulmoner ( $p=0,875$ ) ve nörolojik ( $p=0,895$ ) açıdan fark yoktu. DM açısından gruplar arasındaki fark bulundu ( $p=0,043$ ). SDBY ile birlikte DM varlığı, yaşlı hastalarda kalça kırıklarının mortalitesini diğer komorbiditelerden bağımsız olarak artırmaktadır. Bu hastaların hastanede kalış süresi ve cerrahi hazırlık süresi daha uzun olmaktadır.

**Anahtar kelimeler:** Son dönem böbrek yetmezliği, yaşlı, kalça kırığı, mortalite

Received: 10.10.2017

Accepted: 21.01.2018

<sup>1</sup>Katip Celebi University, Izmir Ataturk Training and Research Hospital, Department of Orthopaedics and Traumatology, Izmir, Turkey

**Yazışma adresi:** Mesut Tahta, Katip Celebi University, Izmir Ataturk Training and Research Hospital, Department of Orthopaedics and Traumatology, Karabaglar, Izmir, Turkey

**e-mail:** mesuttahta@gmail.com

## INTRODUCTION

Hip fracture alone is a cause of mortality in elderly patients with a 20% rate of mortality within 1 year of the fracture<sup>1,2</sup>. Various comorbid factors make a significant contribution to mortality rates and it is known that as the number of comorbid diseases increases in patients with hip fractures, a significant increase in mortality occurs<sup>3</sup>. A highly significant comorbid factor is the end-stage renal disease (ESRD), which is seen at the rate of 5%-10%, and causes severe complications<sup>4</sup>. The incidence of hip fracture in ESRD patients is also known to be increased<sup>5,6</sup> and with this comorbid condition, the mortality risk of hip fracture in elderly patients is expectedly higher<sup>7</sup>.

However, as there is generally more than one comorbid factor in elderly patients with ESRD, the evaluation of the factor which has an effect on mortality, is one of the main problems of comparative studies in the literature. With an increase in the number of comorbid factors, an increase is also expected in the mortality risk<sup>2</sup>. However, with the current problem of high mortality rates seen in elderly patients with hip fractures, the issue whether ESRD alone and independent from all other factors, has an effect on mortality has not been clarified yet. The aim of this study was to evaluate this relationship.

## MATERIAL and METHOD

A retrospective evaluation was performed on all the patients aged 65 years and over who were admitted to our clinic with a diagnosis of primary hip fracture between January 2012 and April 2013. Patients were included in the study if they were ambulatory before the fracture, had no pathological fracture and treated with partial hip prosthesis. The national population registry system was accessed for patients who met the study criteria and the date of death, if occurred, was noted. Patients who had survived for more than 1 year postoperatively were excluded from the study. The total number of patients who met the study criteria were separated into

2 groups as those with (Group 1; n=37) and without ESRD (Group 2; n=281) (Table 1).

The term of hip fracture for the patients in the study included both intertrochanteric and femoral neck fractures. Depending on the type of fracture and the configuration of the femoral bone, cemented or uncemented partial hip prosthesis was applied by the same surgical team. Patients with ESRD received hemodialysis 1 day preoperatively. Mobilization as tolerated was initiated on postoperative Day 1.

The patients in both groups were compared with respect to mean age, gender, cardiac ejection fraction (EF), total hospital stay, the time from hospital admission to operation, bone cement usage, operating time and mortality parameters.

Comorbid factors were present in the patients, so the patients of both groups were subdivided into groups according to comorbid diseases. Cardiac comorbidities group included hypertension, coronary heart disease, congestive heart failure, and arrhythmia. The pulmonary comorbidities group included chronic obstructive pulmonary disease, pneumonia, asthma, and pulmonary hypertension. Neurological comorbidities group included cerebrovascular events and Alzheimer's disease. Accordingly, Group 1 and Group 2 were compared with respect to cardiac, pulmonary, and neurological comorbid diseases and diabetes mellitus (DM).

IBM SPSS Statistics Version 22 software was used in the statistical analysis of the study. In the comparisons between the groups, the Pearson Chi-square test and the Fisher's Exact test were used in the evaluation of categorical data and in the statistical analysis of continuous data, which did not conform to normal distribution, Mann Whitney U-test was used. A value of  $p < 0.05$  was accepted as statistically significant.

The study protocol was approved by the local ethics committee.

**RESULTS**

No difference was determined between the groups with respect to mean age ( $p=0.782$ ), gender distribution ( $p=0.659$ ), cardiac ejection fraction ( $p=0.285$ ), bone cement usage ( $p=0.971$ ) and duration of operation ( $p=0.758$ ).

A statistically significant difference was determined between the groups with respect to total hospitalization period ( $p<0.001$ ), time from hospital admission to operation ( $p<0.001$ ) and mortality rates ( $p=0.009$ ) (Table 1).

As a result of the comparison of the groups according to comorbid factors, no difference was seen in regarding the presence of cardiac ( $p=0.570$ ), pulmonary ( $p=0.875$ ), and neurological comorbidities ( $p=0.895$ ). The difference between the groups with respect to DM was determined to be significant ( $p=0.043$ ) (Table 1).

**Table 1. Distribution and comparison of the patients according to the specified criteria.**

	Group 1 (n=37)	Group 2 (n=281)	p
Age	79,35±7,66	79,36±8,94	0,782
F/M	23/14	185/96	0,659
EF	55,32±10,72	57,69±7,06	0,285
Cemented/Uncemented	17/20	130/151	0,971
Operation (Hour)	2,01±0,36	1,97±0,24	0,758
Hospitalization (Day) <sup>1</sup>	13,32±5,15	10,84±6,65	<0,001
Day of surgery <sup>2</sup>	8,86±4,22	6,59±3,30	<0,001
Mortality	37,80%	24,90%	0,009
Cardiac CD	86,49%	89,68%	0,570
Pulmonary CD	21,62%	22,78%	0,875
Neurologic CD	16,22%	17,08%	0,895
DM	40,54%	24,91%	0,043

<sup>1</sup>Total duration of hospitalization, <sup>2</sup>Number of days from hospitalization to surgery, F: Female, M: Male, EF: Cardiac ejection fraction, CD: Co morbid disease, DM: Diabetes mellitus

**DISCUSSION**

In the current study of elderly patients treated with hemiarthroplasty, by partially isolating ESRD from other comorbid factors, it was revealed that ESRD solely increased mortality in hip fractures. In addition, it must be taken into account that ESRD itself is

a factor that increases mortality irrespective of the presence of a hip fracture<sup>8,9</sup>. In nephrology literature, in a study by Mittalhenkle et al.<sup>10</sup> it was concluded that hip fracture was associated with a more than 2-fold increase in the incidence rate of mortality and the 1-year survival rate for dialysis patients after a hip fracture was found to be approximately 50% fold increased than that of the patients without a hip fracture. In another words, when ESRD patients develop a hip fracture, mortality rates are increased compared to patients without ESRD. However, from the perspective of an orthopedic surgeon, the important question is not ‘Does a hip fracture in ESRD patient increase mortality?’ but rather ‘If a patient with a hip fracture has ESRD, does mortality rate increase?’ In this context, all the patients had hip fractures and the presence of ESRD was an independent variable in the current study. Similarly, Tierney et al.<sup>11</sup> reported that although significant results were not obtained because the number of the study group was small, mortality rates were higher in patients with ESRD who developed a hip fracture. In a study by Karaminogullari et al.<sup>12</sup> which evaluated the results of different surgeries applied to hip fracture patients with ESRD, it was concluded that surgical treatment of hip fractures in patients with ESRD who were on chronic hemodialysis was associated with frequent complications and a higher mortality rates.

In the current study, the total hospitalization period and the time from hospital admission to operation were seen to be longer in the patients in Group 1. All these patients received hemodialysis before the operation. Thus, it is an expected situation that the time from hospital admission to operation was longer in these patients. During the postoperative period, 12 patients were discharged after they received dialysis which significantly shortened total hospitalization period. In a study of 2660 elderly patients with hip fracture, Moran et al.<sup>13</sup> evaluated the effect of operating time on mortality, and 30-day mortality was determined as 10.7% for patients for whom the surgery had been delayed for more than 4 days, compared to 7.3% in those delayed for 1-4 days. The group whose surgery was delayed for >4 days also had significantly

higher mortality rates at 90 days and 1 year. It was concluded that mortality rates did not increase when the surgery was delayed for up to 4 days for patients who were otherwise fit for hip fracture surgery, although a delay of more than 4 days significantly increased mortality rates. In the current study, the mean time to operation of the patients in Group 1 was 8.8 days and in Group 2, 6.5 days and in both periods, the critical time were >4 days. Some authors also advocate that the critical period is the first 2 days<sup>14,15</sup>. According to the data in the literature, the time to operation was longer in the current study is a weak point of the study.

In the current study, the rate of diabetes mellitus (40.54%) in patients with ESRD (Group 1) was significantly higher than that of the patients in Group 2 which indicated that ESRD could develop as a complication of diabetes mellitus. Leehay et al.<sup>16</sup> reported that the most significant cause of ESRD was diabetes mellitus. Similarly, Packham et al.<sup>17</sup> stated that DM has been the most common cause of ESRD requiring renal replacement therapy in developed countries for the past 10 years, and patients with type 2 diabetes constitute most of these patients. However, when renal involvement in a patient with DM progresses to ESRD, it has become a topic of interest as to whether high mortality is related to complications of DM or ESRD.

More strict conclusions could be obtained with a study evaluating the effect of all comorbid diseases, separately. However, for example, there were 5 patients with asthma in Group 1 and 21 in Group 2 and 3 patients with cerebrovascular events in Group 1 and 9 in Group 2. As the number of patients was low for the evaluation of comorbid diseases and similar situations, it was thought that this scarce number of patients could reduce the power of the study. Therefore, it was aimed to increase the power of the statistical comparison by grouping comorbid diseases according to the system involved. So, further prospective studies with higher numbers would undoubtedly make greater contribution to the data in literature.

In conclusion, ESRD with DM increases mortality of hip fractures in the elderly independent from other comorbidities. These patients have a longer period of total hospitalization and surgical preparation time.

## REFERENCES

- Osnes EK, Lofthus CM, Meyer HE, Falch JA et al. Consequences of hip fracture on activities of daily life and residential needs. *Osteoporos Int.* 2004;15:567-74. <https://doi.org/10.1007/s00198-003-1583-0>
- Sener M, Onar V, Kazimoğlu C, Yağdı S. Mortality and morbidity in elderly patients who underwent partial prosthesis replacement for proximal femoral fractures. *Eklemler Hastalıkları Cerrahisi.* 2009;20:11-7.
- Meyer HE, Tverdal A, Falch JA, Pedersen JI. Factors associated with mortality after hip fracture. *Osteoporos Int.* 2000;11:228-32. <https://doi.org/10.1007/s001980050285>
- Kuo LT, Lin SJ, Hsu WH, Peng KT et al. The effect of renal function on surgical outcomes of intracapsular hip fractures with osteosynthesis. *Arch Orthop Trauma Surg.* 2014;134:39-45. <https://doi.org/10.1007/s00402-013-1884-5>
- Alem AM, Sherrard DJ, Gillen DL, Weiss NS et al. Increased risk of hip fracture among patients with end-stage renal disease. *Kidney Int.* 2000;58:396-9. <https://doi.org/10.1046/j.1523-1755.2000.00178.x>
- Lindberg JS, Moe SM. Osteoporosis in end-stage renal disease. *Semin Nephrol.* 1999;19:115-22.
- Lin JC, Liang WM. Mortality and complications after hip fracture among elderly patients undergoing hemodialysis. *BMC Nephrol.* 2015;16:100. <https://doi.org/10.1186/s12882-015-0099-0>
- Lowrie EG, Curtin RB, LePain N, Schatell D. Medical outcomes study short form-36: a consistent and powerful predictor of morbidity and mortality in dialysis patients. *Am J Kidney Dis.* 2003;41:1286-92. [https://doi.org/10.1016/S0272-6386\(03\)00361-5](https://doi.org/10.1016/S0272-6386(03)00361-5)
- Pifer TB, McCullough KP, Port FK, Goodkin DA et al. Mortality risk in hemodialysis patients and changes in nutritional indicators: DOPPS. *Kidney Int.* 2002;62:2238-45. <https://doi.org/10.1046/j.1523-1755.2002.00658.x>
- Mittalhenkle A, Gillen DL, Stehman-Breen CO. Increased risk of mortality associated with hip fracture in the dialysis population. *Am J Kidney Dis.* 2004;44:672-9. [https://doi.org/10.1016/S0272-6386\(04\)00958-8](https://doi.org/10.1016/S0272-6386(04)00958-8)
- Tierney GS, Goulet JA, Greenfield ML, Port FK. Mortality after fracture of the hip in patients who have end-stage renal disease. *J Bone Joint Surg Am.* 1994;76:709-12. <https://doi.org/10.2106/00004623-199405000-00012>
- Karaeminogullari O, Demirors H, Sahin O, Ozalay M et al. Analysis of outcomes for surgically treated hip fractures in patients undergoing chronic hemodialysis. *J Bone Joint Surg Am.* 2007;89:324-31.
- Moran CG, Wenn RT, Sikand M, Taylor AM. Early mortality after hip fracture: is delay before surgery important? *J Bone Joint Surg Am.* 2005;87:483-9. <https://doi.org/10.2106/00004623-200503000-00001>
- Al-Ani AN, Samuelsson B, Tidermark J, Norling A, Ekström W et al. Early operation on patients with a hip fracture improved the ability to return to independent living. A prospective

- study of 850 patients. *J Bone Joint Surg Am.* 2008;90:1436-42.  
<https://doi.org/10.2106/JBJS.G.00890>
15. Shiga T, Wajima Z, Ohe Y. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. *Can J Anaesth.* 2008;55:146-54.  
<https://doi.org/10.1007/BF03016088>
16. Leehey DJ, Kramer HJ, Daoud TM, Chatha MP et al. Progression of kidney disease in type 2 diabetes - beyond blood pressure control: an observational study. *BMC Nephrol.* 2005;6:8.  
<https://doi.org/10.1186/1471-2369-6-8>
17. Packham DK, Alves TP, Dwyer JP, Atkins R, de Zeeuw D et al. Relative incidence of ESRD versus cardiovascular mortality in proteinuric type 2 diabetes and nephropathy: results from the DIAMETRIC (Diabetes Mellitus Treatment for Renal Insufficiency Consortium) database. *Am J Kidney Dis.* 2012;59:75-83.  
<https://doi.org/10.1053/j.ajkd.2011.09.017>