Postoperative Weight-Bearing after Uncemented Bipolar Hemiarthroplasty for Femoral Neck Fractures in Geriatric Patients with Dementia

Sîrbu Paul-Dan
Faculty of Medicine
Grigore T. Popa University of Medicine and Pharmacy
Strada Universității 16, Iași 700115, Romania
Phone: 0232 301 600
pdsirbu@yahoo.com

Norin Forna
Faculty of Medicine
Grigore T. Popa University of Medicine and Pharmacy
Strada Universității 16, Iași 700115, Romania
Phone: 0232 301 600
norin.forna@gmail.com

Dragoș Cristian Popescu
Faculty of Medicine
Grigore T. Popa University of Medicine and Pharmacy
Strada Universității 16, Iași 700115, Romania
Phone: 0232 301 600
dragospopescu1975@yahoo.com

Razvan Tudor
Vaslui County Hospital, Department of Orthopaedics and Traumatology
233 Stefan cel Mare St. 730006 Vaslui, Romania
Phone: 0235312120
rc_tudor@yahoo.com

Wilhelm Friedl
Wertheim Hospital, Department of Orthopedics and Traumatology
Rotkreuzstraße 2 · 97877 Wertheim, Germany
Phone: 09342/303-0
wilhelm.friedl@gmail.com

Anamaria Ciubara
Dunărea de Jos University of Galați
Strada Domnească 47, Galați, Romania
Phone: 0336 130 108
anamburlea@yahoo.com

Bogdan Mihnea Ciuntu
Faculty of Medicine
Grigore T. Popa University of Medicine and Pharmacy
Strada Universității 16, Iași 700115, Romania
Phone: 0232 301 600
bogdanmciuntu@yahoo.com

Grigore Berea
Emergency County Hospital Piatra Neamț, Department of Orthopedics and Traumatology
1 Traian Blvd., 611003 Piatra Neamtț, Romania
Phone: 0233.21.94.40
grigberea@yahoo.com

Abstract

Dementia and hip fractures are two crucial problems in the elderly and the associations of these pathologies increase substantial morbidity and mortality. 178 patients with dementia (average age 81.5 years) were operated with an uncemented bipolar prosthesis for a displaced femoral neck

fracture. They started rehabilitation sessions in the immediate postoperative period and were divided into two groups: group 1 – partial weight-bearing for 72 cases – and group 2 – total weight-bearing for 106 cases. 17 patients were unable to walk and 6 died during hospitalization. 172 patients were discharged to a rehabilitation department (46.6%) or to their home with (31.9%) or without (21.5%) rehabilitation facilities. During follow-up, 103 out of 172 patients accepted a phone interview. After three months 55 patients had regained the pre-fracture level of independence (6 patients from group 1 and 49 patients from group 2; 81% were included in a rehabilitation program). The mortality at one year postoperative period was 26.21%; the majorities of these patients were included in group 1, were more than 80 years old and had more than 4 comorbidities (except dementia).

The authors concluded that, for patients undergoing uncemented bipolar HA, immediate total weight-bearing and discharging to a rehabilitation facility showed a better recovery and return to the pre-fracture level, as well as a better one-year survival rate.

Keywords: Dementia; Femoral Neck Fractures; Hemiarthroplasty; Weight-bearing; Rehabilitation

1. Introduction

Dementia and hip fractures are two crucial problems in elderly patients and both are associated with substantial morbidity and mortality (Friedman et. al., 2010; Mizrahi et. al., 2018). Dementia is a global loss of cognitive and intellectual functioning which gradually interferes with social and occupational performance (McGilton et. al., 2012; Vun et. al., 2017). In comparison with cognitively intact persons, the patients with dementia have 3 times higher hospitalization rates, 2 times higher hospitalization stay and 2.3 times higher relative risk of death (Friedman et. al., 2010; Draper et. al., 2011; Pinkert & Holle, 2012).

Traumatic lesions are one of the most frequent causes of hospital admission for patients with dementia (Lai et. al., 2018; Lach, Harrison & Phongphanngam, 2016; McGilton et. al., 2007). Due to the important relationship between dementia and osteoporosis (Yamaguchi, 2015), the elderly patients with cognitive impairment are more likely to have a fragility hip fracture (Draper, Karmel, Gibson, Peut & Anderson, 2011). 68% of hip fractures occur in patients over 65 years (Braithwaite, Col & Wong, 2003).

A lot of studies in the literature found that the prognosis for this serious health care problem is affected by age, comorbidities, fracture type and surgical procedure, dementia and pre-fracture functional aspect (Mizrahi et. al., 2018; Young, Xiong & Pruzek, 2011). Despite the fact that dementia can affect the motivation of patients for rehabilitation (McGilton et. al., 2007), some studies found that cognitive impairment do not complicate recovery post hip-fracture surgery in those who were mobile before the fracture (Mizrahi et. al., 2018; Mitchell, Harvey, Brodaty, Draper & Close, 2016).

Most elderly patients with hip fracture undergo surgery in order to save the patient's life and to facilitate independence in activities of daily living (Uzoigwe et. al., 2013; Handoll, Cameron, Mak & Finnegan, 2009). While for intertrochanteric fractures, the internal fixation (IF) seems to be the best solution, for displaced femoral neck fractures, hemiarthroplasty (HA) is the only surgical solution (Yin et. al., 2015; Sirbu et. al., 2017).

These different types of operations and implants prompted the use of different postoperative protocols regarding immediate weight-bearing: partial or full weight-bearing for HA and restricted or no weight-bearing for IF (Kayali, Agus, Ozluk & Sanli, 2006; Kim, Hur, Hwang, Choi & Kim, 2014). Unfortunately, restricted weight-bearing can delay the functional recovery of geriatric patients, being a sensitive predictor of mortality (Koval, Sala, Kummer & Zuckerman, 1998; Kadowaki, Kono, Nishiguchi, Kakimaru & Uchio, 2012). Dementia can impact the rehabilitation and the mortality rate according to these various protocols for weight-bearing (McGilton et. al., 2007; Fansa, Huff & Ebraheim, 2016; Lai, Tang, Kuo & Hsu, 2018).

The aim of this retrospective work is to quantify the early postoperative weight-bearing after uncemented bipolar hemiarthroplasty for femoral neck fractures in geriatric patients with dementia, in order to determine if weight-bearing is related to the future rehabilitation and one-year mortality in these difficult patients.

2. Materials and Methods

Between 1st January 2013 and 31st December 2016, 330 patients aged ≥ 65 years were admitted and operated for a displaced femoral neck fracture in a level 1 trauma center, out of which 178 patients (64 males and 114 females) had dementia (cognitive impairment from neurodegeneration) associated with numerous other comorbidities (osteoporosis, hypertension, congestive heart failure, peripheral vascular disease, chronic pulmonary disease, mild liver disease, renal disease, diabetes).

The average age was 81.5 years (range 74-96 years). All the patients were able to walk indoors and outdoors independently or with assistive devices before the fracture. The type of operative treatment was hemiarthroplasty with a bipolar uncemented prosthesis using a PAVI femoral stem (made of titanium alloy with a dual coverage). All patients followed a similar postoperative protocol which consisted of an early mobilization and standing with assistance as well as walking with an assistive device. The patients were divided in 2 groups according to the postoperative radiographic control, and surgeon recommendations were: group 1 – partial weight-bearing for 72 cases and group 2 – total weight-bearing for 106 cases.

During the first postoperative day, the patients were seen by the physical therapist for 30-40 minutes, once or twice a day on weekdays and only once a day on weekends and holidays. The intensive physical therapy sessions included: passive, active-assisted and active exercises as well as sessions involving gait training, walking and stairs climbing. While 155 patients used a walker for walking and 6 patients used crutches, 17 patients were unable to walk during hospitalization. None of the patients used a cane for immediate postoperative walking. According to the improving walking ability, the assistive device was changed and selected by the physical therapist. The patients who survived (172 patients) were discharged to an acute-care rehabilitation facility (80 patients – 46.6%) or to their homes, with (55 patients – 31.9%) or without (37 patients – 21.5%) skilled nursing and rehabilitation facilities.

3. Results

The average duration of the stay in hospital was 14.5 day (range 5 to 58 days). A number of 6 patients (2 from group 1 and 4 from group 2, 10.68% of 178 patients) died in hospital. Postoperative complications included pneumonia, pulmonary embolism, cardiac arrhythmia, urinary tract infections, superficial and deep wound infections, decubitus tegumentary complications. One week postoperatively, all the patients used the same assistive device.

Our follow-up was carried out with a phone interview. Out of 172 patients discharged from hospital, 103 patients (32 from group 1, 71 from group 2, including their relatives) accepted the interview.

Three months post-surgery, 49 patients in group 2 with total weight bearing (69%) had regained the pre-fracture level of independence in instrumental activities of daily living and level of home assistance, as compared with 6 patients in group 1 with partial weight bearing. The patients who had been discharged to a hospital or at home with rehabilitation facilities were more likely to have recovered the pre-fracture level of independence (45 patients out of 55 recovered patients, i.e. 81% were included in a rehabilitation program).

1-year postoperative mortality, according to the phone interview results, was 26.21% (27 out of 103 discharged patients); 18 patients were included in group 1 and were more than 80 years old and had more than 4 important comorbidities (except dementia).

4. Discussions

Dementia and hip fractures are serious health care problems in elderly people and often co-exist due to the ageing global population (Vun et. al., 2017). Studies in related literature are insufficient to demonstrate if dementia is the cause or effect of hip fracture, or if a bidirectional relationship between these 2 medical challenges can be identified (Friedman et. al., 2010; Vun et. al., 2017). In the same time, osteoporosis is a progressive musculoskeletal disease consisting of structural deterioration of bone architecture which leads to bone fragility and fractures (Vun et. al., 2017; Sirbu et. al., 2017). Unfortunately, hip fractures are often life-changing or even life-ending events (Vun et. al., 2017).

Multiple studies showed high mortality rates and poor functional results after hip fractures in geriatric population (Kapicioglu et. al., 2014; Mossey, Mutran, Knott & Craik, 1989), dementia being a bad prognostic factor (Mizrahi et. al., 2018; McGilton et. al., 2012).

According to the type of surgical procedure (IF for intertrochanteric fracture, or HA for displaced femoral neck fracture), the immediate postoperative protocol for weight-bearing is crucial regarding the return to the functional level before the fracture, while dementia compromises the adherence to this protocol (Lai et. al., 2018). The biomechanical advantages of prosthesis which allowed an immediate full weight-bearing were the reason for a better survival rate for geriatric patients as compared with those receiving IF (Lai et. al., 2018).

Due to the possible sudden death complication of cemented hemiarthroplasty in cardiac geriatric patients with femoral neck fractures (Parvizi, Holiday, Ereth & Lewallen, 1999), we have used an uncemented bipolar prosthesis (Haidukewych, Israel & Berry, 2002) for 178 patients with dementia, with a femoral stem covered with hydroxyapatite, which improved prosthetic fixation and allowed total weight-bearing before osseointegration (Sirbu et. al., 2011; Trandafir et. al., 2018). The ideal weight-bearing protocol after uncemented hemiarthroplasty is controversial, but limitation in weight-bearing can compromise the results and the recovery, especially in geriatric patients with dementia. Our results demonstrated that immediate full weight-bearing and including the patients in a rehabilitation program allowed a better recovery of independence in activities in daily living, with a better one-year survival rate.

In contrast to the improvement of the walking ability and level of home assistance for patients included in the rehabilitation program, the improvement of cognitive functions was minimal.

5. Conclusions

Dementia and hip fractures are challenging medical situations. For patients undergoing uncemented bipolar HA, immediate total weight-bearing and discharging to a rehabilitation facility showed a better recovery and return to the pre-fracture level, as well as a better one-year survival rate.

References

Braithwaite, R., Col, N., & Wong, J. (2003). Estimating Hip Fracture Morbidity, Mortality and Costs. Journal Of The American Geriatrics Society, 51(3), 364-370. doi: 10.1046/j.1532-5415.2003.51110.x

Draper, B., Karmel, R., Gibson, D., Peut, A. and Anderson, P. (2011). The Hospital Dementia Services Project: age differences in hospital stays for older people with and without dementia. International Psychogeriatrics, 23(10), pp.1649-1658.

Draper, B., Karmel, R., Gibson, D., Peut, A., & Anderson, P. (2011). The Hospital Dementia Services Project: age differences in hospital stays for older people with and without dementia. International Psychogeriatrics, 23(10), 1649-1658. doi: 10.1017/s1041610211001694

Fansa, A., Huff, S., & Ebraheim, N. (2016). Prediction of Mortality in Nonagenarians Following the Surgical Repair of Hip Fractures. Clinics In Orthopedic Surgery, 8(2), 140.

doi: 10.4055/cios.2016.8.2.140.

Friedman, S., Menzies, I., Bukata, S., Mendelson, D. and Kates, S. (2010). Dementia and Hip Fractures. Geriatric Orthopaedic Surgery & Rehabilitation, 1(2), pp.52-62.

Haidukewych, G., Israel, T., & Berry, D. (2002). Long-Term Survivorship of Cemented Bipolar Hemiarthroplasty for Fracture of the Femoral Neck. Clinical Orthopaedics And Related Research, 403, 118-126. doi: 10.1097/00003086-200210000-00019

Handoll, H., Cameron, I., Mak, J., & Finnegan, T. (2009). Multidisciplinary rehabilitation for older people with hip fractures. Cochrane Database Of Systematic Reviews. doi: 10.1002/14651858.cd007125.pub2

Kadowaki, M., Kono, M., Nishiguchi, K., Kakimaru, H., & Uchio, Y. (2012). Mortality in patients with hip fracture aged over 90 years: A report from a progressively aging island. Archives Of Gerontology And Geriatrics, 54(2), e113-e117. doi: 10.1016/j.archger.2011.10.003

Kapicioglu, M., Ersen, A., Saglam, Y., Akgul, T., Kizilkurt, T., & Yazicioglu, O. (2014). Hip fractures in extremely old patients. Journal Of Orthopaedics, 11(3), 136-141. doi: 10.1016/j.jor.2014.06.009

Kayali, C., Agus, H., Ozluk, S., & Sanli, C. (2006). Treatment for Unstable Intertrochanteric Fractures in Elderly Patients: Internal Fixation versus Cone Hemiarthroplasty. Journal Of Orthopaedic Surgery, 14(3), 240-244. doi: 10.1177/230949900601400302

Kim, Y., Hur, J., Hwang, K., Choi, I., & Kim, Y. (2014). The Comparison of Compression Hip Screw and Bipolar Hemiarthroplasty for the Treatment of AO Type A2 Intertrochanteric Fractures. Hip & Pelvis, 26(2), 99. doi: 10.5371/hp.2014.26.2.99

Koval, K., Sala, D., Kummer, F., & Zuckerman, J. (1998). Postoperative Weight-Bearing after a Fracture of the Femoral Neck or an Intertrochanteric Fracture*. The Journal Of Bone & Joint Surgery, 80(3), 352-6. doi: 10.2106/00004623-199803000-00007

Lach, H., Harrison, B. and Phongphanngam, S. (2016). Falls and Fall Prevention in Older Adults With Early-Stage Dementia: An Integrative Review. Research in Gerontological Nursing, 10(03), pp.139-148.

Lai, Y., Tang, P., Kuo, T. and Hsu, C. (2018). Different impacts of dementia on two-year mortality after osteosynthesis and hemiarthroplasty in treating geriatric hip fractures. Archives of Gerontology and Geriatrics, 79, pp.116-122.

Lai, Y., Tang, P., Kuo, T., & Hsu, C. (2018). Different impacts of dementia on two-year mortality after osteosynthesis and hemiarthroplasty in treating geriatric hip fractures. Archives Of Gerontology And Geriatrics, 79, 116-122. doi: 10.1016/j.archger.2018.08.011

McGilton, K., Davis, A., Mahomed, N., Flannery, J., Jaglal, S., Cott, C., Naglie, G. and Rochon, E. (2012). An inpatient rehabilitation model of care targeting patients with cognitive impairment. BMC Geriatrics, 12(1).

McGilton, K., Wells, J., Teare, G., Davis, A., Rochon, E., & Calabrese, S. et. al. (2007). Rehabilitating Patients With Dementia Who Have Had a Hip Fracture. Topics In Geriatric Rehabilitation, 23(2), 161-173. doi: 10.1097/01.tgr.0000270185.98402.a6

Mitchell, R., Harvey, L., Brodaty, H., Draper, B., & Close, J. (2016). Hip fracture and the influence of dementia on health outcomes and access to hospital-based rehabilitation for older individuals. Disability And Rehabilitation, 38(23), 2286-2295. doi: 10.3109/09638288.2015.1123306

Mizrahi, E., Harel, N., Heymann, A., Lubart, E., Leibovitz, A., Malik Gadot, E. and Barkan, R. (2018). The relation between gain in cognition during rehabilitation on functional outcome among hip fracture adult patients with and without pre- hip fracture dementia. Archives of Gerontology and Geriatrics, 78, pp.177-180.

Mossey, J., Mutran, E., Knott, K., & Craik, R. (1989). Determinants of recovery 12 months after hip fracture: the importance of psychosocial factors. American Journal Of Public Health, 79(3), 279-286. doi: 10.2105/ajph.79.3.279

Parvizi, J., Holiday, A., Ereth, M., & Lewallen, D. (1999). Sudden Death During Primary Hip Arthroplasty. Clinical Orthopaedics And Related Research, 369, 39-48. doi: 10.1097/00003086-199912000-00005

Pinkert, C. and Holle, B. (2012). Menschen mit Demenz im Akutkrankenhaus. Zeitschrift für Gerontologie und Geriatrie, 45(8), pp.728-734.

Sirbu, D., & Petreus, T., Munteanu, F., Pertea, M., Lunca, S., Poroch, V., & Botez, P. (2011). Clinical Experience with a Macroporous Synthetic Bone Substitute (Eurocer®) in the Treatment of the Patients with Bone Defects. 10.1007/978-3-642-22586-4_75.

Sirbu, P.D. & Tudor, R & Berea, G & Scripcaru, A & Ciubara, B & Badulescu, O.V.. (2017). Bipolar polyethylene radial head artroplasty in posttraumatic unstable elbows: Prosthetic design and clinical results. Materiale Plastice. 54. 298-301.

Sirbu, P.D. & Tudor, R & Veringa, V & Ciuntu, B.M. & Radu, V & Ciubara, B & Badulescu, O.V. (2017). Strontium ranelate in the healing of fractures complicated with delayed union. It is really effective?. Revista de Chimie. 68. 1825-1828.

Trandafir, L., Baciu, G., Constantin, M.-M., Maștaleru, A. Temneanu, O.-R., Mihai, B., Novac, O., Frasinariu, O., Ivan, A., Tudorachi, N. B., Hiary, R. A. L., & Moscalu, M. (2018). Predictive biological markers in post-therapeutic evolution in obese patients. Revista de Chimie. 69. 3048-3051.

Uzoigwe, C., Burnand, H., Cheesman, C., Aghedo, D., Faizi, M., & Middleton, R. (2013). Early and ultra-early surgery in hip fracture patients improves survival. Injury, 44(6), 726-729. doi: 10.1016/j.injury.2012.08.025

Vun, J., Ahmadi, M., Panteli, M., Pountos, I. and Giannoudis, P. (2017). Dementia and fragility fractures: Issues and solutions. Injury, 48, pp.S10-S16.

Yamaguchi, K. (2015). Cognitive Function and Calcium. The link between dementia and bone and calcium metabolism disorders. Clinical Calcium, 25, 189-194.

Yin, B., Guo, J., Dong, T., Chen, W., Zhao, H., Sun, T., ... Yin, Z. (2015). Clinical features and proportion analysis of adult hip fractures at 11 hospitals in Southwest China from 2010 to 2011. Zhonghua Wai Ke Za Zhi, 53, 349-352.

Young, Y., Xiong, K., & Pruzek, R. (2011). Longitudinal Functional Recovery After Postacute Rehabilitation in Older Hip Fracture Patients: The Role of Cognitive Impairment and Implications for Long-Term Care. Journal Of The American Medical Directors Association, 12(6), 431-438. doi: 10.1016/j.jamda.2010.08.005