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Dual Mobility Total Hip Arthroplasty in the Treatment of Emoral Neck Fracture: A Systematic Review of the Literature

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Abstract

Background and Aim: Femoral neck fractures (FNF) represent a major public health problem worldwide. Total hip arthroplasty (THA) is indicated by many authors for FNF treatment especially in patients without severe comorbidities and with relatively high functional demand. However, high dislocation rate is matter of concern. Dual mobility implants result in low dislocation rates in primary and revision setting, however the application to FNF treatment is less studied. Aim of the study is to review the literature about DM THA in FNF treatment.

Materials and Methods: A systematic review of the literature has been performed.

Results: Eleven studies of level I and II were included, with meanly short follow up (maximum 3 years). Dislocation rate ranged from 0% (6 on 11 studies) to 4.6%, resulting lower than conventional THA when compared. Clinical results were comparable to conventional THA.

Conclusion: DM implants result to have a low dislocation rate and good clinical results in FNF treatment at short term follow-up.

Keywords: *Femur, Hip Joint; Radiography; Torsion Abnormality.*

Introduction

Femoral neck fractures(FNF) represent a major public health problem worldwide. Hip hemiarthroplasty (HA) represents the preferred method of treatment in most cases [1], due to brief surgical time, relative easiness of the procedure and limited perioperative blood loss. On the other hand, total hip arthroplasty(THA) is associated with a lower rate of re-operation, less pain and a better functional outcome [2]. Therefore, THA is indicated by many authors for FNF treatment especially in patients without severe comorbidities and with relatively high functional demand. One of the most important complications of arthroplasty for FNF treatment in represented by dislocation, with an incidence reported around 3.8% for HA and 10% for THA [3, 4, 5]. Nonetheless, FNF patients are at high risk for prosthetic dislocation with respect to hip arthritis patients, because of a combination of muscular insufficiency, cognitive and neurologic disorders and recurrent falls that characterize this population of patients. With the introduction of the dual-mobility (DM) socket, many authors reported a lower dislocation rate both in primary THA and revision implants [6]. On the other hand, DM implants can suffer a unique failure mechanism known as an intra prosthetic dislocation (IPD), in which the inner prosthetic femoral head disengages from the outer PE bearing, due to an abnormal PE wear [7]. However, the rate of this typically late complication (mean time to failure 8-11 years) encountered a 10 times reduction with the introduction of highly cross linked PE [8]. In a recent review made in 2017, De Martino et al. reported a low dislocation and IPD rate for DM THA both in primary surgery (0,9% and 0,7% respectively, mean 6.8 years follow-up) and in revision setting (3.3% and 1.3% respectively, mean 4.4 years follow-up) [6]. Conversely, the use of DM implants in FNF treatment is much less studied in the literature, with few papers available. The aim of the present study is to review the literature about the clinical outcome of dual mobility THA in FNF treatment, with particular focus on hip dislocation and intraprosthetic dislocation rate.

Material and Methods

A systematic review of the literature was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, to identify outcomes of DM components in THA for FNF. A search of PubMed, MEDLINE, Embase and Google Scholar was conducted using various combination of the keywords “dual mobility”, “dual-mobility”, “hip”, “cup”, “socket”, “femoral neck” and “fracture”. No limit was set regarding the year of publication and the language used. Two independent researchers (A.M. and G.C.) scanned all the articles for title and abstract. Disagreements were resolved by arbitration, and consensus was reached after discussion. The last search was performed in November 2017. Literature reviews, biomechanical studies, technical notes, letters to editors, pilot studies, feasibility studies and instructional courses were exclu-ded. In addition, reference lists of the included articles were manually checked by the authors for missed studies. The following data were extracted: age, comorbidities, mortality rate, episodes of prosthetic and intra prosthetic dislocation, surgical approach, surgical time, blood loss, other complications, clinical results, costs. Missing data regarding any of the above mentioned parameters were not considered

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a matter for exclusion of the study.

Results

With the systematic review more than 150 articles were found. The reviewers identified a total of 22 eligible papers, of which 11 were excluded applying exclusion criteria. Thus, 11 papers were selected by the authors to be considered for the present review. Of these, 8 specifically evaluated the results of DM THA in FNF, while the remaining 3 reported the results of DM implants for FNF together with different implants or other indications. Eight studies were retrospective and 3 prospective. A total of 4 studies were multi centric, of which 2 retrospective and 2 prospective. One of them was a register study. Detailed results and study characteristics of selected papers are reported in Table 1.

Tarasevicius et al. retrospectively evaluated in 2010, 98 patients treated for FNF with both conventional THA (56 patients-mean age 74) and DM THA (42 patients-mean age 75). All patients were operated via posterior approach without posterior soft tissue repair. At 1 year follow-up, authors reported no dislocations in the DM THA group, while 8 dislocations occurred in the conventional THA group, more frequently associated to 28mm heads. They concluded that DM implants determine a lower risk of dislocation with respect to conventional THA despite the theoretical disadvantage of the learning curve. Although no cost-effectiveness analysis was carried-out, the authors state that the approximately three-times higher cost of DM cup could be compensated by the missed secondary hospitalization after dislocation [9].

In a similar retrospective study in 2013 Tarasevicious et al. considered a population of 71 patients, treated in 36 cases with conventional THA and in 35 with DM implants for FNF fracture. Mean age of the population was 76 years for conventional THA group and 75 years for DM group. Mortality at 1 year was comparable between the two groups (14% for DM group vs 15% for conventional THA group). All the patients were operated via posterior approach. The authors found no dislocations at 1 year follow-up in the DM group and 7 dislocations in the control group, 5 of which were revised for recurrent dislocations. There were no significant differences between the groups considering any subscale of the HOOS score, mobility or use of walking aids or the EQ-5D in any dimension [10]. Adam et al. in 2012 in a prospective multi centric study conducted in 11 hospitals evaluated 214 patients with a mean age of 83 years (range 70 -103) treated with DM THA for FNF. The mean time to treatment was 3 days, with 57% of cases operated in the first 48 hours. A posterior approach was used in 80% of cases and a lateral or anterolateral approach in the remaining 20%. None of the patients was lost at follow-up at 9 months. Mortality rate was reported to be 11% at 3 months and 19% at 9 months. Functional outcome evaluation at 9 months documented in 70% of cases no increase in dependency in daily living activities. Fifty percent of patients did not need any walking assistance at home and 31% were independent from walking aids. The authors found 3/214 cases of dislocation (1.4%). All dislocations occurred within the first 3 months from surgery in patients treated via a posterior approach. All patients underwent close reduction under general anesthesia, none of them had recurrent dislocation. Complications other than dislocation needing surgical treatment were noticed in 3.7% of cases [11].

Bensen et al. in a retrospective study conducted in Denmark in 2010 evaluated 171 patients (mean age 84.1 years) treated with bipolar HA and 175 patients (mean age 75.2 years) treated with DM THA for FNF. All patients were operated via posterolateral approach with reconstruction of posterior capsule and external rotators. At mean 21.7 months follow-up in DM THA group and mean 25.3 months in HA group they found statistically significant differences between the two groups, with better results in the DM THA group in terms of dislocation rate (4.6% vs 14.6%), reoperation (9.1% vs 18.7%) and mortality rate at one year (12-23% vs 22-36%, C.I. 95%). Conversely, the HA group had better results in terms of length of surgery (68 mins vs 74 mins) and perioperative blood loss (310 ml vs 424 ml), which also resulted to be statistically significant. All the dislocations happened within the first 50 days after surgery in both groups, with 21 on 25 (84%) in the HA group and 3 on 8 (37.5%) in the DM group requiring surgical revision. Moreover, the authors found no obvious relationship between surgeon's level of experience and number of dislocations in both groups. Other complications needing surgical treatment occurred in 6.43% and 7.4% of cases in HA and DM THA groups respectively [12].

In a spanish retrospective multi centric study Torres-Pérez A et al. reported in 2014 on 135 THA with dual mobility socket, of which 31.8% implanted for hip arthritis and 68.1% for hip fracture. Mean follow-up was 32 months and mean age of patients was 82.1 years. Patients included in the study presented several comorbidities [Table 1], with a high prevalence (41.4%) of neuromuscular or psychiatric comorbidities, such as Parkinson's disease, Alzheimer's disease, dementia and stroke. All patients were operated via posterolateral approach. Fourteen patients died during follow-up, with a mortality rate of 10.4%. The authors reported good results for both groups, with a dislocation rate in the whole population of 1.48%. Unfortunately, the authors did not report the detailed incidence of dislocation of the DM group [13].

A french prospective study published by Jean-Christophe Bel and Jean-Paul Carret in 2015 reported the results of two groups of patients aged 70 years or more affected by FNF. Each group counted 40 patients, treated with either HA or DM THA via 2 different approaches, MIS and standard anterior. There were 18 dual mobility implants in the MIS group. Detail for the control group is missing but the distribution of implant types is reported to be similar. There was no difference between the two groups in terms of mean age (84 vs 83 years) and sex distribution. DM implants were not evaluated separately from HA as the aim of the study was to evaluate the results of the MIS approach. However, no dislocations in the whole population at 12 months follow-up were reported [14].

Hailer et al. in 2012 in a Swedish register study reported on 78,098 THA at a mean follow-up of 2.7 (0-6) years. Thirty percent of patients were aged 75 years or more. Ten percent (7,785) of all patients were treated for FNF, with 174 cases treated with DM THA. The authors documented a revision rate due to dislocation of 0.5%, 69% of which during the first postoperative year and 15% during the second postoperative year. Diagnosis of FNF was associated to an increased risk of revision due to dislocation. However, no revision due to dislocation was reported for DM implants, with the difference in incidence from other implants that did not result to be statistically significant. Unfortunately, due to the study design, the authors reported only dislocations treated with surgical revision, without considering closed reduction that were not reported in the register [15].

Nich et al. reported in 2015 on 83 DM THA implants in 82 patients aged over 75 years treated for FNF. Mean age of patients was 86.7± 5 years (range, 76.4-98.3 years). Mean BMI was 22.3 ± 3.8 (range, 15.4-35.2). The mean American Society of Anesthesiologists (ASA) score was 2.44 ± 0.57 (range, 1-4). At least one severe comorbidity

YEAR	TYPE	LEVEL	STUDY CHARACTERISTIC	FOLLOW-UP	AGE	DISLOCATION RATE	IPD	SURGICAL APPROACH	PREOPERATIVE COMORBIDITIES	MORTALITY RATE	SURGICAL TIME	BLOOD LOSS	CLINICAL OUTCOMES	OTHER COMPLICATIONS	COSTS
2010	retrospective	II	42 (42.85%) DM implants vs 56 (57.15%) conventional THA	1 year	75 (SD 10) in DM 74 (SD 10) in THA	0/42 in DM Vs 8/56 (14.3%) in THA	no								DM implant 3 times more expensive
2012	prospective multicentric	I	214 DM implants	9 months	83 (range 70 – 103)	3/214 (1.40%) (within first 3 months) All via post	no	172/214 (80%) Posterior 42/214 (20%) Lateral/anterolateral		11% (25/214) at 3 months 19% (40/214) at 9 months			151/214 (70%) no increase in dependency 38/214 (18%) more personal care 107/214 (50%) walking assistance outside home 66/214 (31%) free of walking assistance	8/214 (3.7%) needing additional proceudres: 2 infections (debridement) 5 periprosthetic fractures of the femur (osteosyntheis - 1 after 3 months) 1 infection and mobilization of the cup (revision)	
2012	register study	II	Register study on 78098 THA 7785 (10%) FNF 174 (2.23%) DM	2,7 years (range 0-6)	< 50 y.o.: 2,513 (3%) 50–59 y.o.: 8,851 (11%) 60–75 y.o.: 43,117 (55%) > 75 y.o.: 23,617 (30%)	0% (closed reduction)	0%	35,460 (45%) lateral approach 41,904 (54%) posterior approach 734 (1%) MIS							
2013	retrospective	II	35 (49.3%) DM implants vs 36 (50.7%) conventional THA	1 year	75 (SD 9) in DM 76 (SD 10) in THA	0% (in DM)	no	Posterior (100%)		15% DM group 14% conventional THA group			no difference with conventional THA: 22 patients in DAC (62.8) and 23 patients in THA (63.8%) walked independently 28 patients in both groups (77,7-80%) were using none or one stick EQ-5D no difference in any dimension The EQ-5D VAS= 60 for DAC - 55 for THA		
2014	retrospective	II	175 (50.6%) DM implants vs 171 (49.4%) bipolar HA	21.7 months (range 0.3-62.2) for DM vs 25.3 months (range 0.3-62.4) for HA	75.2 (43-98) in DM vs 84.1 (46-100) in HA	8/175: 4.60% vs 25/171: 14.6% (within first 50 days)	no	Posterolateral 100% (including reconstruction of posterior tissues)		30/175 (12-23%) in DM Vs 50/171 (22-36%) in HA C.I. 95%	74 (70-78) mins in DM VS 68 (65-72) mins in HA	424 ml (266–481) in DM Vs 310 ml (268–352) in HA		Reoperation rate: 32/171 (18.7 %) in HA - 16/175 (9.1%) in DM without dislocations: 11/171 (6.4%) in HA - 13/175 (7.4%) in DM Post-operative periprosthetic fracture 4/171 (2.3%) - 6/175 (3.4%) Loosening of components 2/171 (1.2%) - 1/175 (0.6%) Deep infection 5/171 (2.9%) - 4/175 (2.3%) Haematoma post-operatively 0/171 (0%) - 1/175 (0.6%) Other causes 0/171 (0%) - 1/175 (0.6%)	

2014	retrospective multicentric	II	135 DM implants 82 (68.1%) FNF 43 (31.8%) OA	36 months (range 12-60)	82.1 (75-92)	2/135 (1.48%) within first 2 months	no	Posterior (100%)	78/136 (64.5%) hipertesion 54/135 (44.6%) anticoagulant therapy 33/135 (27.3%) cardiopathy 27/135 (22.3%) diabetes 56/135 (41.4%) neuromuscular diseases (Parkinson's d., Alzheimer d., senile and vascular dementia)	14/135 (10.4%)			PMA: preoperative 10.13 - 1 year 16.07 Difference 5,94 points EuroQOL at 1 year 56% walk independently 2% no able to walk 58% completely independent 88% difficulties to perform daily activities 30% no pain - 60% moderate 50% no depression - 45% moderate	15 (11.1%) Surgical complications: 4 DVTs 3 infections (1 superficial) 5 periprosthetic fractures (2 during surgery, 2 in the first month, 1 within 3 months) 2 loosened cups 1 subsided stem 13 (9.6%) General complications: 2 pneumothorax 6 haematomas 1 distress rerspiratory sindrome 4 urinary tract infections	
2015	prospective	I	80 FNF 40 MIS (18 DM) vs 40 standard approach	12 months	84 (70 – 98) in MIS group 83 (71-99) in control group	0%	no				75 mins (60-90) For both groups	430ml in MIS vs 550ml in control	average chair rising and walking resume was 6 days (range 2-8) in MIS group 9 days (range 2-14) in control group state of rehabilitation at three months was similar in both groups	No prosthesis-related complications and no infection was noted in both groups. average incision length was 7 (6-8) cm and a 26.3 BMI in the minimally invasive group Against 16 (12-20) cm and a 26.1 BMI in control group cerclage wire for a crack in the femoral nec: 3 patients in MIS group vs 2 patients in control group analgesic consumption was 30% lower for patients in the MIS group	
2015	retrospective	II	83 DM implants in 80 patients	23.8±9.4 months (range 12.1-42)	86.7 (76.4 – 98.3)	4.40% (within first 10 days)	2.2 % (within first 18 days)	Posterolateral (without posterior reconstruction)	50 patients (60%) had at least one severe medical condition (Alzheimer's disease, dementia or chronic heart failure)	19% at 1 year 36.5% at last follow-up	82 (range 46-97 min)		mean PMA score: 6.1 ± 2.7 post-operatively compared to 6.8 ± 2.3 pre-operatively mean Devane physical activity score: 1.9 ± 0.9 at the last follow-up compared to 2.1 ± 0.8 pre-operatively At the last follow-up 34 Charnley A, 4 as B and 7 as C compared to 37 A, 5 B and 3 C pre-operatively Only one patient was not able to return home after rehabilitation.	7 (8.4%) surgical complications: 2 cases of reoperation for acute post-operative infection (< 4 weeks) 3 cases of transient post-operative sciatic palsy 2 scar hematomas 3 (3.6%) general complications: 2 cases of pulmonary embolism 1 deep veinous thrombosis	
2016	retrospective	II	121 DM (40 FNF, 81 OA)	13.1 months in FNF Vs 16.9 months in OA	79.5 ± 8.1 in FNF group Vs 76.2 ± 6.9 in OA group	0%	no	Anterior	FNF group had significantly higher comorbidities: Neuromuscular disorder 8/40 (20%) in FNF vs 1/81 (1.2%) in OA Cognitive dysfunction 9/40 (22.5%) in FNF vs 0/81 (0%) in OA	3.8%	103+/-26 in FNF Vs 115 ± 22.2 in OA			Total complications: 7 (17.5%) in FNF - 7 (8.6%) in OA Total intra-operative complication: 2 in FNF – 3 in OA Acetabular fracture: 1 in FNF Calcar fracture: 1 In FNF - 2 in OA Other: 1 in OA Total post-operative complication: 5 in FNF – 4 in OA Surgical complication: 1 in FNF - 1 in OA Superficial infection: 1 in OA Peri-prosthetic fracture: 1 in FNF Medical complication during the hospitalization: 3 in FNF - 2 in OA	

2017	prospective multicentric	I	2 DM implant series: Serie 1: 83 FNF vs 553 degenerative Serie 2: 139 FNF vs 1315 degenerative	3 years	81.7 years (51–99) in FNF Vs 71.2 years (36–98) in degenerative	1.2-1.43% in FNF 0.15% in degenerative	no	Posterior (52% in FNF – 84% in degenerative) Lateral (6% in FNF – 16% in degenerative) Trans-trochanteric (42% in FNF – 0% in degenerative)		19.3% FNF Vs 1.3% degenerative					
2017	retrospective	II	20 DM implants	12.1 months (range 0.4–47.6)	83 (range 81–88)	0%	no	Posterior (with repair of the short external rotators)	Dementia: 100% Eight patients (40%) had an ASA score of 2 12 patients (60%) had an ASA score of 3	5/20 (25%) at 1month 9/20 (45%) at 1 year	108 mins (90-123)			no deep infections	

was reported in 60% of patients. The mean time to surgery was 1.34 ± 1.04 days (range, 0 - 6 days). Posterolateral piriformis-preserving approach was used in each case. Neither reconstruction of the posterior capsule nor reinsertion of the other external rotators was performed. The mean length of surgery was 82 min ± 27 min (range, 46-97 min). The mean follow-up was 23.8±9.4 months (12.1-42 months). Mortality at final follow-up was 36.5% (30 patients, 31 hips), while mortality rate at 1 year was 19%. The authors reported 2 dislocations (4.4%) which occurred within 10 days from surgery and 1 IPD (2.2%) which occurred 18 days after surgery. All dislocation cases underwent revision surgery. Other complications occurred in 10 cases (12%) [16].

In a Japanese retrospective study published in 2016, Yasuhiro Homma et al. compared the outcome of DM THA implanted in 40 cases of FNF (Group A) and 81 cases of hip osteoarthritis (Group B). Mean follow-up was 13.1 months (range 3 -36). All interventions were performed via direct anterior approach. Group A patients were significantly older than Group B patients (79.5 ± 8.1 vs 76.2 ± 6.9). Operative time was significantly shorter in Group A (103 ± 26.9 minsvs 115 ± 22.2 mins). Complication rate was slightly higher in group A (17.5% vs 8.6%) but without statistical significance. Mortality rate in group A was 2.5% (1 in 40 patients) at three months follow-up and 3.8% (1 in 26 patients) at 12 months follow-up, with 14 patients lost at final follow-up. No patients died in group B. The authors found no dislocations in both groups, despite the theoretical risk of group A was higher owing to older age and higher incidence of neuromuscular and cognitive disorders [17].

Two articles published in 2017 were included in the study.

The first one is a prospective study reporting data collected in six private French institutions from May 2012 to December 2016. The authors compared the outcomes of DM THA in degenerative hip disease and FNF. Mean follow up was 3 years. Surgical approach was posterior in 52%. Mean age was about ten years higher for FNF group (81.7 vs 71.2 years). More than 60% of the FNF patients were ASA score > 3 to be compared with the less than 15% rate of the degenerative disease group. The authors reported a mortality rate of 19.3% and 1.3% in the FNF and degenerative disease groups respectively. Dislocation rate was reported to be between 1.2% and 1.43% in the two FNF groups studied, while 0.15% rate was found in the degenerative disease groups. No cases of IPD were reported [18].

Finally, Graversen et al. evaluated 20 patients affected by dementia treated for displaced FNF with DM THA. Mean age was 83 years (range 81-88). All patients were considered unable to follow the rehabilitation program. Most patients were ASA 3. Mean time to surgery was 27 hours (range 20–37 hours), mean operative time was 108 minutes (range 90-123 min), mean length of hospital stay was 5.5 days (range 4.0–7.6 days). Median follow-up time was 12.1 months (range 0.4–47.6). The authors found a high mortality rate (25% within 30 days an 45% within one year). However, no dislocations, no revisions and no infections occurred in the study population despite comorbidities [19].

Discussion

The aim of the present study was to review the literature about the clinical outcome of dual mobility THA in FNF treatment, with particular focus on hip dislocation and intraprosthetic dislocation rate. The results of the present review demonstrate a growing interest in DM THA implant for FNF treatment. Pros of the study are the systematic design and the mean high level of retrieved studies, with prevalent level I and II papers. Moreover, mean retrieved studies level was high, with prevalent level I and II studies. On the other hand, mean follow-up resulted to be short, with neither study exceeding 3 years.

Patients demographic characteristics resulted to be in line with literature reports about

literature reports about FNF [20, 26], with mean age ranging from 75 and 85 years. Mortality rate was also comparable to other literature reports on FNF treatment, attesting around 15-20% at 1 year [25, 26]. Comorbidities were present in a relevant number of cases. In particular, the high percentage of neuromuscular diseases and cognitive impairment reported should be noted. Torres-Perez et al reported a 41.4% prevalence of these pathologies in their study population [14]. A similar prevalence was reported by Yasuhiro Homma et al. (42.2%), resulting to be much higher than in osteoarthritis patients (1.2%) in their study [17]. These data reflect both the peculiarities of FNF patients and the choice of clinicians to implant DM sockets in patients at maximal risk of dislocation. The study conducted by Graversen et al. on 20 patients affected by dementia is a clear demonstration of this tendency [19].

Despite these reported comorbidities, dislocation and IPD rates were found to be very low. In detail, dislocation rate ranged from 0 to 4.6% of cases, with 6 papers reporting no dislocations including the study by Graversen et al on dementia patients [9, 11, 12, 15, 17, 19]. These data are almost in line with dislocation rates for DM implants in primary and revision setting (0.9 - 3.3%) [6] and compare favorably with reported dislocation rates for conventional THA in FNF setting (ranging from 2% to 9%) [20-23]. Moreover, in the retrieved studies comparing DM THA and conventional THA or HA for FNF treatment dislocation rate was lower in DM implants. To be noted the time to dislocation, which resulted to be meanly very short with most papers reporting 2 to 3 months [10, 13, 14] and one reporting most events within 10 days [16]. These findings result in line with other literature reports, to confirm the early post-operative period to be at maximum risk [29, 30]. As far as IPD is concerned, the present review confirms this complication to be rare. Ten papers on 11 found no cases of IPD, while Nich et al. found 2 cases in 80 patients (2.2%) [16]. Interestingly, these events were noted within 18 days from surgery, suggesting a possible technical error (poor impaction of the PE insert over the prosthetic head) as the authors also state.

Surgical approaches used in the retrieved studies were various, including posterolateral, antero-lateral, lateral, transtrochanteric and anterior, both standard and MIS. Literature often reports higher dislocation rates for posterolateral approach, especially if external rotators and posterior capsule are not repaired [26]. However, conclusive evidence is still lacking. In the present review the differences in studies design and the high variability in surgical approaches do not permit to find eventual associations between dislocation rate and surgical approach.

Functional outcomes resulted to be mainly good or excellent in most papers. Nonetheless, DM results were not significantly better than conventional THA when compared [27], thus confirming the good results of prosthetic replacement of FNF whatever implant is used.

Surgical time was specifically evaluated in few studies and blood loss only in two, with one reporting the detail for DM implants. In these few studies DM performed worse than hemiarthroplasty for both parameters [13, 15-17, 19]. However, this difference was not significant in any paper and was not associated with clinically relevant consequences.

Unfortunately, none of the articles included in the review specifically evaluated costs related to treatment. However, Tarasevicius et al. state that initial more elevated implant-related cost could be paired by the lower complications and re-operation rate and especially by missed hospitalization due to dislocation [9].

Finally, both surgical site and general complications were reported with a relevant incidence in most papers. Surgical site complications other than dislocation ranged from 3.6% to 11.1%, and general complications up to 9.6% [10, 13-17]. The latter rates resulted comparable to HA and conventional THA when evaluated, and higher than OA patients. However, if dislocations were included in the total complications count, DM THA performed better than HA and conventional THA. These data result in line with the literature, with relevant complications rate due to the intrinsic fragility of FNF patients but with a protective role of DM implants with respect to dislocation [25, 28].

Conclusions

Dual mobility THA demonstrates a lower rate of dislocation with respect to THA and an almost comparable rate of dislocation with respect to HA in FNF treatment at short term follow-up. Intra prosthetic dislocation seems to be a negligible problem at short term with modern implants unless technical errors occur. Well-designed studies with longer follow-up are needed to determine if both hip and intraprosthetic dislocation rate remain low at long term. Due to the heterogeneity of the studies no conclusive evidence about clinical results, mortality rate and other complications can be drawn. The lack of cost-effectiveness studies does not allow to demonstrate if the increased initial costs of treatment might be paired by the missed secondary hospitalization for dislocation.

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