

· 临床论著 ·

开放获取

股骨头置换与髓内钉固定老年股骨粗隆间骨折比较[△]

张生志, 王文庆, 宋江润, 麻伟, 宋小东, 赵宝宝

(甘肃医学院附属医院关节与运动医学科, 甘肃平凉 744000)

摘要: [目的] 比较股骨头置换与髓内钉固定治疗老年股骨粗隆间骨折的临床疗效。[方法] 回顾性分析本院 2015 年 8 月—2020 年 8 月 128 例老年股骨粗隆间骨折患者的临床资料, 根据医患沟通结果, 66 例采用股骨头置换 (置换组), 62 例采用髓内钉固定 (固定组), 比较两组围手术期、随访及影像结果。[结果] 置换组的手术时间 [(62.9±5.2) min vs (52.5±4.9) min, $P<0.001$]、切口总长度 [(15.1±0.8) cm vs (12.2±0.8) cm, $P<0.001$]、术中失血量 [(301.8±40.9) ml vs (142.9±20.2) ml, $P<0.001$]、住院时间 [(13.7±1.1) d vs (12.6±1.5) d, $P<0.001$] 均显著多于固定组, 但术中透视次数 [(3.5±1.1) 次 vs (13.8±2.1) 次, $P<0.001$] 和下地行走时间 [(3.4±1.3) d vs (18.0±4.6) d, $P<0.001$] 显著少于固定组。置换组的完全负重时间 [(24.0±2.0) d vs (59.4±2.6) d, $P<0.001$] 显著早于固定组。随时间推移, 两组 VAS 评分、Harris 评分均显著改善 ($P<0.05$), 术后相应时间点置换组 VAS 评分显著优于固定组 ($P<0.05$); 置换组术后 1、3 个月的 Harris 评分显著优于固定组 ($P<0.05$)。影像方面, 与术前相比, 末次随访时, 置换组双侧股骨长度差显著减小; 与术后即刻相比, 末次随访时固定组颈干角 (femoral neck shaft angle, FNSA) 显著减小 ($P<0.05$), 顶尖距 (tip-apex distance, TAD) 显著增加 ($P<0.05$)。[结论] 对于老年股骨粗隆间骨折, 髓内钉内固定和股骨头置换均可取得较好疗效, 相比较而言, 只要术前患者本身条件许可, 股骨头置换更具有优势。

关键词: 老年人, 股骨粗隆间骨折, 股骨头置换, 股骨近端防旋转髓内钉

中图分类号: R683.42

文献标志码: A

文章编号: 1005-8478 (2024) 16-1441-07

Hip hemiarthroplasty versus intramedullary nail fixation for femoral intertrochanteric fractures in elderly // ZHANG Sheng-zhi, WANG Wen-qing, SONG Jiang-run, MA Wei, SONG Xiao-dong, ZHAO Bao-bao. Department of Joint Surgery and Sports Medicine, Affiliated Hospital, Gansu Medical College, Pingliang, Gansu 744000, China

Abstract: [Objective] To compare the clinical outcomes of hip hemiarthroplasty versus internal fixation with proximal femoral nail anti-rotation (PFNA) for femoral intertrochanteric fractures in the elderly. [Methods] A retrospective study was conducted on 128 elderly patients who received surgical treatment for femoral intertrochanteric fractures in our hospital from August 2015 to August 2020. According to the preoperative doctor-patient communication, 66 patients received hip hemiarthroplasty (the hemiarthroplasty group), while other 62 patients received PFNA fixation (the PFNA group). The documents regarding to perioperative period, follow-up and images were compared between the two groups. [Results] Although the hemiarthroplasty group proved significantly greater than the PFNA group in terms of operative time [(62.9±5.2) min vs (52.5±4.9) min, $P<0.001$], total incision length [(15.1±0.8) cm vs (12.2±0.8) cm, $P<0.001$], intraoperative blood loss [(301.8±40.9) ml vs (142.9±20.2) ml, $P<0.001$], and length of hospital stay [(13.7±1.1) days vs (12.6±1.5) days, $P<0.001$], the former was significantly better than the latter in intraoperative fluoroscopy times [(3.5±1.1) times vs (13.8±2.1) times, $P<0.001$] and the ambulation time [(3.4±1.3) days vs (18.0±4.6) days, $P<0.001$]. In addition, the hemiarthroplasty group regained full weight bearing activity significantly earlier than the PFNA group [(24.0±2.0) days vs (59.4±2.6) days, $P<0.001$]. The VAS score and Harris score significantly improved in both groups over time ($P<0.05$), and the hemiarthroplasty group was significantly superior to the PFNA group in terms of VAS score at all time point after surgery ($P<0.05$), and Harris scores at 1 and 3 months after operation ($P<0.05$). With respect of imaging, the leg length discrepancy in the hemiarthroplasty group significantly reduced at the last follow-up compared with that before surgery. On other hand, the femoral neck shaft angle (FNSA) significantly decreased ($P<0.05$), whereas the tip-apex distance (TAD) significantly increased in the PFNA group at the last follow-up compared with those immediately after operation ($P<0.05$). [Conclusion] Both hemiarthroplasty and PFNA fixation achieve satisfactory consequences for femoral intertrochanteric fractures in the elderly. In comparison, hemiarthroplasty is more advantageous as long as the patient's own conditions permit before surgery.

Key words: elderly, femoral intertrochanteric fractures, hip hemiarthroplasty, proximal femoral nail anti-rotation

DOI:10.20184/j.cnki.issn1005-8478.100622

△基金项目: 甘肃省高校教师创新基金项目 (编号: 2024B-213)

作者简介: 张生志, 主任医师, 研究方向: 关节外科及运动医学, (电子信箱) 421108847@qq.com

股骨粗隆间骨折又称为股骨转子间骨折，是一种好发于老年人的髋部骨折^[1]。随着人口老龄化的加剧，股骨粗隆间骨折的患者逐渐增多^[2]。由于患者年龄大，有不同程度的骨质疏松，主要脏器条件欠佳，并发症多，多为不稳定骨折，但此类患者下床行走意愿强烈，故治疗方法的选择对治疗效果就显得尤为重要，而保守治疗并发症多、死亡率高，因此目前多采用手术治疗^[3, 4]，其主要目的是使患者尽早下地活动，同时，国内外研究认为，手术应尽早进行^[5]。笔者对本院 2015 年 8 月—2020 年 8 月 128 例老年股骨粗隆间骨折，分别采取人工股骨头置换（hemiarthroplasty, HA）与股骨近端防旋髓内钉（proximal femoral nail anti-rotation, PFNA）内固定治疗，比较两种手术方式的临床疗效，总结如下。

1 资料与方法

1.1 纳入与排除标准

纳入标准：（1）新鲜股骨粗隆间骨折；（2）年龄 ≥ 80 岁；（3）无髋部疾病史；（4）行股骨头置换或 PFNA 内固定手术治疗；（5）获得 1 年及以上随访。

排除标准：（1）采用保守治疗者；（2）陈旧性骨折、病理性骨折；（3）患者存在认知能力障碍，无法配合手术者。

1.2 一般资料

回顾性分析 2015 年 8 月—2020 年 8 月本院收治的 128 例老年股骨粗隆间骨折患者的临床资料，根据医患沟通结果，66 例采取股骨头置换（置换组），62 例采用髓内钉内固定（固定组），两组患者术前一般资料见表 1。两组年龄、性别、BMI、损伤至手术时间、侧别以及 Evans 分型比较的差异无统计学意义（ $P > 0.05$ ）。本研究经医院医学伦理委员会审批（甘医附院伦审字[2020]第 038 号），所有患者均签订知情同意书。

表 1. 两组术前一般资料比较

Table 1. Comparison of preoperative general information between the replacement and fixation groups

指标	置换组 (n=66)	固定组 (n=62)	P 值
年龄(岁, $\bar{x} \pm s$)	86.6 \pm 3.9	86.4 \pm 3.3	0.712
性别(例,男/女)	27/39	19/43	0.226
BMI(kg/m ² , $\bar{x} \pm s$)	20.2 \pm 0.9	20.3 \pm 1.2	0.694
损伤至手术时间(d, $\bar{x} \pm s$)	6.3 \pm 1.1	6.4 \pm 1.2	0.688
侧别(例,左/右)	30/36	30/32	0.740
Evans 分型(例, III/IV/V)	18/26/22	20/31/11	0.129

1.3 手术方法

置换组：健侧卧位，取患侧后外侧入路，显露股骨颈直至骨折处，尽量复位骨折并用巾钳固定，屈膝内旋患肢，使足底朝天，显露股骨颈及小粗隆，保留股骨距 1.0 cm 以上，截骨，取出股骨头，开髓，扩髓，安置假体试模。置入选定的双动股骨头加长股骨假体。严重骨质疏松患者可用骨水泥固定。克氏针钢丝张力带固定大转子骨块。关闭伤口。

固定组：仰卧位，将患肢内旋内收位固定于骨科牵引床支架上，健侧下肢悬垂，透视下复位骨折，直至恢复正常的颈干角、前倾角，固定好牵引床。取经大转子纵行切口，逐层显露，透视下撬拨复位骨折。取股骨大转子顶点偏内为进针点，打入导针，开孔扩髓，选择合适粗细及长度的 PFNA 置入股骨髓腔；透视下见骨折复位良好，颈干角正常，经股骨颈中下 1/3 置入螺旋刀片（确保良好顶尖距），安置远端锁定螺钉及主钉尾帽。透视确定骨折复位和 PFNA 位置良好，活动髋关节骨折端稳定后关闭切口。术后穿“丁”字鞋。

1.4 评价指标

记录围手术期指标，主要包括麻醉方式、手术时间、切口长度、术中失血量、透视次数、切口愈合情况、下地行走时间及住院时间。采用完全负重活动时间、疼痛视觉模拟评分（visual analogue scale, VAS）、Harris 评分评价临床效果。行影像学检查，置换组评价股骨柄假体位置^[7, 8]；记录双侧肢长差、骨折复位及假体位置，有无脱位及假体松动情况。固定组采用 Baumgaertner 标准评定骨折复位质量^[6]，测量颈干角（femoral neck shaft angle, FNSA）、顶尖距（tip-apex distance, TAD）的变化情况，观察内固定有无松动。

1.5 统计学方法

采用 SPSS 26.0 软件进行统计学分析。计量数据以 $\bar{x} \pm s$ 表示，资料呈正态分布时，组间比较采用独立样本 t 检验，组内比较采用单因素方差分析；资料呈非正态分布时，采用非参数统计。计数资料采用 χ^2 检验或 Fisher 精确检验。等级资料采用秩和检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 围手术期情况

两组患者均顺利完成手术，两组围手术期资料见表 2。置换组的手术时间、切口总长度、术中失血

量、住院时间均显著多于固定组 ($P<0.05$), 但术中透视次数和下地行走时间显著少于固定组 ($P<0.05$), 两组麻醉方式、切口愈合等级的差异均无统计学意义 ($P>0.05$)。

指标	置换组 (n=66)	固定组 (n=62)	P 值
麻醉方式 (例, 神经根/椎管内/全麻)	37/17/12	30/20/12	0.596
手术时间 (min, $\bar{x} \pm s$)	62.9 \pm 5.2	52.5 \pm 4.9	<0.001
切口总长度 (cm, $\bar{x} \pm s$)	15.1 \pm 0.8	12.2 \pm 0.8	<0.001
术中失血量 (ml, $\bar{x} \pm s$)	301.8 \pm 40.9	142.9 \pm 20.2	<0.001
术中透视次数 (d, $\bar{x} \pm s$)	3.5 \pm 1.1	13.8 \pm 2.1	<0.001
切口愈合 (例, 甲/乙/丙)	57/9/0	55/7/0	0.688
住院时间 (d, $\bar{x} \pm s$)	13.7 \pm 1.1	12.6 \pm 1.5	<0.001
下地行走时间 (d, $\bar{x} \pm s$)	3.4 \pm 1.3	18.0 \pm 4.6	<0.001

2.2 随访结果

两组患者均获得 1 年以上有效随访, 随访情况见表 3。置换组的完全负重时间显著早于固定组 ($P<0.05$), 术后随时间推移, 两组 VAS 评分均显著减少 ($P<0.05$), Harris 评分显著增加 ($P<0.05$)。术后 1、3 个月以及末次随访时, 置换组 VAS 评分显著优于固定组 ($P<0.05$); 置换组术后 1、3 个月的 Harris 评分显著优于固定组 ($P<0.05$); 两组患者末次随访的 Harris 评分差异无统计学意义 ($P>0.05$)。

表 3. 两组随访结果 ($\bar{x} \pm s$) 与比较

Table 3. Comparison of follow-up results between the replacement and fixation groups ($\bar{x} \pm s$)

指标	置换组 (n=66)	固定组 (n=62)	P 值
完全负重活动时间 (d)	24.0 \pm 2.0	59.4 \pm 2.6	<0.001
VAS 评分 (分)			
术后 1 个月	3.5 \pm 0.5	4.5 \pm 0.5	<0.001
术后 3 个月	2.5 \pm 0.5	3.5 \pm 0.5	<0.001
末次随访	0.6 \pm 0.5	0.9 \pm 0.9	0.017
P 值	<0.001	<0.001	
Harris 评分 (分)			
术后 1 个月	63.9 \pm 3.7	58.1 \pm 3.4	<0.001
术后 3 个月	75.9 \pm 2.8	71.7 \pm 1.8	<0.001
末次随访	85.6 \pm 2.9	84.8 \pm 2.4	0.117
P 值	<0.001	<0.001	

2.3 影像评估

置换组末次随访假体位置较术后即刻无变化, 双侧肢长差由术前的 (16.4 \pm 1.8) mm 显著减小至末次随访的 (3.1 \pm 1.0) mm ($P<0.001$); 所有患者均未发生髋关节脱位、假体松动。

固定组 Baumgaertner 骨折复位评级末次随访时与术后即刻无显著变化; FNSA 由术后即刻的 (129.2 \pm 4.0) $^{\circ}$ 显著减小至末次随访的 (124.4 \pm 2.9) $^{\circ}$ ($P<0.001$), TAD 由术后即刻的 (22.8 \pm 1.6) mm 显著增加至末次随访的 (24.5 \pm 1.5) mm ($P<0.001$)。末次随访时, 所有患者骨折愈合, 均未出现内固定松动、断裂, 螺钉切出等并发症。典型病例见图 1、2。



图 1. 患者女性, 82 岁, 右侧股骨粗隆间骨折行右侧人工股骨头置换术。1a: 术前 X 线片示 Evans-Jensen IV 型骨折; 1b: 术后 X 线片示假体位置良好; 1c, 1d: 术后 3 个月、1 年复查 X 线片示假体位置良好。

Figure 1. A 82-year-old female received hip hemiarthroplasty for the right femoral intertrochanteric fractures. 1a: Preoperative X-ray revealed Evans-Jensen type IV fractures; 1b: Postoperative X-ray showed the prosthesis in good position; 1c, 1d: Radiographs 3 months and 1 year after surgery demonstrated fracture healing and prosthesis in proper position.



图 2. 患者男性, 80 岁。右侧股骨粗隆间骨折行 PFNA 内固定术。2a: 术前 X 线片示 Evans-Jensen III 型; 2b: 术后 X 线片示内固定物位置良好; 2c, 2d: 术后 3 个月、术后 1 年复查 X 线片示内固定物位置良好。

Figure 2. A 80-year-old male underwent PFNA internal fixation for the right femoral intertrochanteric fractures. 2a: Preoperative radiograph presented Evans-Jensen type III fractures; 2b: Postoperative X-ray revealed good fracture reduction with implants in good position; 2c, 2d: X-rays 3 months and 1 year after surgery showed sound bony healing with implants in good position.

3 讨论

随着我国人口老龄化, 高龄 (≥ 80 岁) 股骨粗隆间骨折发病率逐年增多。保守治疗卧床并发症较多, 具有较高的致残率及死亡率, 据报道, 骨折后 1 年的死亡率为 23%~34%^[9, 10]。2017 年, Johansen 等^[11]报道, 老年髋部骨折患者非手术治疗死亡率可大于 48%。手术治疗为首选。目前手术方式存在争议, 较多采用股骨头置换和髓内钉内固定^[12]。近年来采用人工股骨头置换术治疗高龄股骨粗隆间骨折的报道较多^[13, 14]。手术的目的是尽早下床活动, 减少卧床时间。临床上, 此类患者及家属下床活动的意愿比较强烈; 与其同时, 高龄 (≥ 80 岁) 老年人常伴有不同种类、不同程度的内科基础病, 手术方式的选择对手术的顺利完成非常重要。目前, 此类骨折手术治疗仍以髓内固定 (如 PFNA) 和人工股骨头置换为主, 髓外固定 (钢板) 由于有创伤大、断板和无法早期负重等缺点而很少使用^[15]。

股骨粗隆间骨折髓内固定一度认为是主流治疗方式^[16, 17], 医患双方容易接受, 应用较多, 认为: (1) 顺应人体生物力学特点, 能够较早下床活动; 螺旋刀片设计带来的附加固定稳定性, 适用于不稳定型骨折患者; (2) 手术对骨膜及软组织损伤轻, 有利于骨折愈合; (3) 手术操作相对简单, 手术时间较短, 减少术中风险^[18, 19]。随着人工假体改进和髋关节置换技术的提高, 有学者报道老年性股骨粗隆间骨折, 人工髋关节置换手术治疗疗效良好, 尤其是粗隆部重

新构建的人工髋关节置换方式, 已经取得较为满意的疗效^[20, 21]。使用加长股骨柄, 股骨髓腔远端固定, 术中即可获得牢固稳定, 术后即可下地负重, 不存在骨折愈合, 减少了卧床并发症的出现, 减轻家属护理负担, 缓解骨折部位疼痛, 减轻患者精神负担, 提高生活质量^[22, 23]。

本研究显示: 老年股骨粗隆间骨折发病率和骨质疏松程度均女性高于男性, 与女性生存寿命长、人群基数大有关外, 还与生活方式 (活动少、低钙饮食等)、生理时期 (早绝经、性腺功能减退、高 BMI 等) 等罹患骨质疏松的高危因素有关^[24], 这与其他学者的非骨折人群研究一致^[25], 故在治疗方式选择上要把尽早下床活动, 避免骨质疏松进一步加重, 甚至出现二次骨折放在首位, 同时, 抗骨质疏松、合理的营养和运动管理也非常重要^[26]。老年股骨粗隆间骨折术前评估非常重要, 因为粗隆间骨折固定或置换, 本身手术难度、时间和创伤均不大, 但对于老年患者, 伴随并发症多, 机体应急反应能力有限, 术前评估对手术 (尤其是麻醉) 的耐受性是关键^[27], 评估须有内科和麻醉医师的参加, 急性生理学与慢性健康状况评价系统 II (APACHE II) 评分及氧饱和度监测 (包括吸氧和脱氧状态下) 是必不可少的。由于存在术后隐性失血, 术前纠正贫血及术中术后输血是有必要的^[28, 29]。股骨粗隆间骨折手术麻醉尽量选择神经根阻滞麻醉, 因其定位准确, 安全性高, 对患者机体内环境干扰较小^[30], 椎管内麻醉常用但并不优于全身麻醉, 有舒适度低、效果不确切、穿刺操作容易失败而需更改麻醉方式的缺点^[31], 全身麻醉易于

操作, 全程管理, 效果较好, 但也要注意呼吸功能恢复缓慢、苏醒延迟和血流动力学波动等问题^[32]。同时, 手术应在麻醉平稳后开始, 麻醉观察期内若患者有血压、心率及氧饱和度等指标的异常较大波动, 则立即终止手术。纠正术后贫血和低蛋白血症也很重要, 对术后快速康复、早期下床、避免严重并发症和降低死亡率意义极大, 对此, Lavernia 等^[33]、Lee 等^[34]及 Musallam 等^[35]均有报道。置换组除手术时间和切口长度略长、术中出血量稍多外, 两组随访均取得良好效果, 但置换组下地行走时间和完全负重活动时间明显优于固定组, 这对于患者及其家属至关重要, 对于预防卧床并发症的发生和提高生活质量非常有意义。股骨转子间骨折后, 健侧下肢会较患侧略长, 再加上下地活动后假体会发生一定的下沉, 因此在复位后患侧肢体比健侧肢体长是允许的, 患者不会表现出不适感觉, 对长期稳定性无影响。本研究中的绝大部分病例出现 1~2 mm 股骨柄下沉。FNSA 的正常范围为 110°~140°, FNSA 超出正常范围时容易发生转子间骨折^[36]。TAD 是评估内固定稳定性的重要指标之一, 有学者认为 TAD 为 20~25 mm 时可显著降低螺钉切出风险, 降低内固定术后失败率^[37]。本研究中固定组术后即刻 FNSA 较末次随访时增大, 术后即刻 TAD 较末次随访时减小, 说明随着时间的推移, 由于患者下地活动等因素的影响, FNSA 有一定的减小趋势, TAD 有一定的增大趋势。

总之, 老年 (≥80 岁) 股骨粗隆间骨折, 股骨头置换和髓内钉内固定均能取得满意预后, 但股骨头置换患者早期功能恢复更好, 卧床并发症更少。对于不稳定型转子间骨折的高龄患者, 预期寿命短, 可优先选择股骨头置换; 对于稳定型转子间骨折患者, 仍建议髓内钉内固定。

参考文献

- [1] Sun D, Wang C, Chen Y, et al. A meta-analysis comparing intramedullary with ex-tramedullary fixations for unstable femoral intertrochanteric fractures [J]. *Medicine (Baltimore)*, 2019, 98 (37): e17010. DOI: 10.1097/MD.00000000000017010.
- [2] Chang SM, Hou ZY, Hu SJ, et al. Intertrochanteric femur fracture treatment in asia: what we know and what the world can learn [J]. *Orthop Clin North Am*, 2020, 51 (2): 189-205. DOI: 10.1016/j.ocl.2019.11.011.
- [3] 王志, 康治林, 李珂, 等. PFNA 与 FHR 治疗老年不稳定股骨转子间骨折的成本效益分析 [J]. *中国矫形外科杂志*, 2019, 27 (20): 1841-1844. DOI: 10.3977/j.issn.1005-8478.2019.20.04.
Wang Z, Kang ZL, Li K, et al. Cost-effectiveness analysis of PFNA versus FHR in the treatment of unstable intertrochanteric femoral fractures in the elderly [J]. *Orthopedic Journal of China*, 2019, 27 (20): 1841-1844. DOI: 10.3977/j.issn.1005-8478.2019.20.04.
- [4] 叶茂, 邹毅, 王明辉, 等. 高龄股骨转子间骨折保守治疗与四种手术治疗比较 [J]. *中国矫形外科杂志*, 2017, 25 (22): 2032-2037. DOI: 10.3977/j.issn.1005-8478.2017.22.04.
Ye M, Zou Y, Wang MH, et al. Comparison of conservative treatment and four surgical treatments for intertrochanteric fractures of the femur in advanced age [J]. *Orthopedic Journal of China*, 2017, 25 (22): 2032-2037. DOI: 10.3977/j.issn.1005-8478.2017.22.04.
- [5] Singh D, Singh A, Singh G, et al. Comparative study of the management of intertrochanteric fracture femur with proximal femoral nail vs. the dynamic hipscrew with derotation screw in elderly population [J]. *Cureus*, 2021, 13 (11): e19431. DOI: 10.7759/cureus.19431.
- [6] Mao W, Ni H, Li L, et al. Comparison of Baumgaertner and Chang reduction quality criteria for the assessment of trochanteric fractures [J]. *Bone Joint Res*, 2019, 8 (10): 502-508. DOI: 10.1302/2046-3758.810.BJR-2019-0032.R1.
- [7] Teloken MA, Bissett G, Hozack WJ, et al. Ten to fifteen-year follow-up after total hip arthroplasty with a tapered cobalt-chromium-femoral component (Tri-Lock) inserted without cement [J]. *J Bone Joint Surg Am*, 2002, 84/A (12): 2140-2144. DOI: 10.2106/00004623-200212000-00003.
- [8] Schneider K, Audigé L, Kuehnel SP, et al. The direct anterior approach in hemiarthroplasty for displaced femoral neck fractures [J]. *Int Orthop*, 2012, 36 (9): 1773-1781. DOI: 10.1007/s00264-012-1535-4.
- [9] 胡波, 李华德, 杨有明, 等. 高龄股骨粗隆间骨折股骨头置换与内固定的比较 [J]. *中国矫形外科杂志*, 2021, 29 (2): 180-182. DOI: 10.3977/j.issn.1005-8478.2017.22.04.
Hu B, Li HD, Yang YM, et al. Comparison of femoral head replacement and internal fixation in elderly intertrochanteric femoral fractures [J]. *Orthopedic Journal of China*, 2021, 29 (2): 180-182. DOI: 10.3977/j.issn.1005-8478.2017.22.04.
- [10] Liu VX, Rosas E, Hwang J, et al. Enhanced recovery after surgery program implementation in 2 surgical populations in an integrated health care delivery system [J]. *JAMA Surg*, 2017, 152 (7): e171032. DOI: 10.1001/jamasurg.2017.1032.
- [11] Johansen A, Tsang C, Boulton C, et al. Understanding mortality rates after hip fracture repair using ASA physical status in the National Hip Fracture Database [J]. *Anaesthesia*, 2017, 72 (8): 961-966. DOI: 10.1111/anae.13908.
- [12] 沈宁江, 林坚平, 王广积, 等. 老年股骨转子间骨折不同手术方法比较研究 [J]. *实用骨科杂志*, 2016, 22 (1): 6-10. DOI: 10.13795/j.cnki.sgkz.2016.01.002.
Shen NJ, Lin JP, Wang GJ, et al. Comparative study of different surgical methods for intertrochanteric fractures of the femur in the elderly [J]. *Journal of Practical Orthopaedics*, 2016, 22 (1): 6-10. DOI: 10.13795/j.cnki.sgkz.2016.01.002.
- [13] 牛海平, 邓福仓, 翟玉斌, 等. 钢丝张力带固定股骨大小粗隆在

- 老年 Evans I D 型股骨粗隆间骨折人工股骨头置换术中的应用 [J]. 中国骨与关节损伤杂志, 2023, 38 (2) : 170-171. DOI: 10.7531/j.issn.1672-9935.2023.02.014.
- Niu HP, Deng FC, Zhai YB, et al. Application of wire tension band fixation of the femoral greater and lesser trochanter in artificial femoral head replacement for Evans I D intertrochanteric femoral fracture in the elderly [J]. Chinese Journal of Bone and Joint Injury, 2023, 38 (2) : 170-171. DOI: 10.7531/j.issn.1672-9935.2023.02.014.
- [14] 姚国仕, 李长江, 高凯飞, 等. 人工股骨头置换治疗高龄股骨转子间骨折 [J]. 临床骨科杂志, 2021, 24 (4) : 570. DOI: 10.3969/j.issn.1008-0287.2021.03.028.
- Yao GS, Li CJ, Gao KF, et al. Artificial femoral head replacement for intertrochanteric fracture in elderly femur [J]. Journal of Clinical Orthopedics, 2021, 24 (4) : 570. DOI: 10.3969/j.issn.1008-0287.2021.03.028.
- [15] 韩冰, 刘宏滨, 张传开, 等. PFNA、锁定钢板、人工股骨头置换术治疗高龄股骨粗隆间骨折的比较 [J]. 中国骨与关节损伤杂志, 2019, 34 (4) : 379-381. DOI: CNKI:SUN:GGJS.0.2019-04-014.
- Han B, Liu HB, Zhang CK, et al. Comparison of PFNA, locking plate, and artificial femoral head replacement in the treatment of intertrochanteric fracture of the femur in advanced age [J]. Chinese Journal of Bone and Joint Injury, 2019, 34 (4) : 379-381. DOI: CNKI:SUN:GGJS.0.2019-04-014.
- [16] 苏佳灿, 侯志勇, 刘国辉, 等. 中国骨质疏松性骨折围手术期处理专家共识(2018) [J]. 中国临床医学, 2018, 25 (5) : 860-867. DOI: 10.12025/j.issn.1008.6358.2018.20181053.
- Su JC, Hou ZY, Liu GF, et al. Expert consensus on perioperative management of osteoporotic fractures in China (2018) [J]. Chinese Journal of Clinical Medicine, 2018, 25 (5) : 860-867. DOI: 10.12025/j.issn.1008.6358.2018.20181053.
- [17] 蔺海山, 米尔阿里木·木尔提扎, 赵巍, 等. 双动头人工股骨头置换术与 PFNA 内固定治疗老年不稳定股骨粗隆间骨折的疗效比较 [J]. 中国骨与关节损伤杂志, 2020, 35 (10) : 1058-1060. DOI: 10.7531/j.issn.1672-9935.2020.10.015.
- Lin HS, Mir Alimu MRTZ, Zhao W, et al. Comparison of the efficacy of double-action head artificial femoral head replacement and PFNA internal fixation in the treatment of unstable intertrochanteric femoral fractures in the elderly [J]. Chinese Journal of Bone and Joint Injury, 2020, 35 (10) : 1058-1060. DOI: 10.7531/j.issn.1672-9935.2020.10.015.
- [18] 王子越, 董启榕, 徐又佳, 等. 人工股骨头置换与内固定治疗高龄患者不移位股骨颈骨折的疗效比较 [J]. 中华创伤骨科杂志, 2016, 18 (5) : 369-374. DOI: 10.3760/cma.j.issn.1671-7600.2016.05.001.
- Wang ZY, Dong QR, Xu YJ, et al. Comparison of the efficacy of artificial femoral head replacement and internal fixation in the treatment of nondisplaced femoral neck fracture in elderly patients [J]. Chinese Journal of Orthopaedic Trauma, 2016, 18 (5) : 369-374. DOI: 10.3760/cma.j.issn.1671-7600.2016.05.001.
- [19] 郑晓峰, 孙天祥. 两种术式治疗老年股骨粗隆间骨折比较 [J]. 中国矫形外科杂志, 2021, 29 (24) : 2290-2292. DOI: 10.3977/j.issn.1005-8478.2021.24.20.
- Zheng XF, Sun TX. Comparison of two operative styles for the treatment of intertrochanteric fractures of the femur in the elderly [J]. Orthopedic Journal of China, 2021, 29 (24) : 2290-2292. DOI: 10.3977/j.issn.1005-8478.2021.24.20.
- [20] 曾卓辉, 廖瑛扬, 欧阳孔顺, 等. 生物型加长柄人工股骨头置换术结合股骨粗隆重建治疗高龄不稳定股骨粗隆间骨折 [J]. 中国骨与关节损伤杂志, 2021, 36 (12) : 1284-1286. DOI: 10.7531/j.issn.1672-9935.2021.12.016.
- Zeng ZH, Liao YY, Ouyang KS, et al. Treatment of unstable intertrochanteric femoral fracture in advanced age by biologic lengthening stem artificial femoral head replacement combined with trochanteric reconstruction [J]. Chinese Journal of Bone and Joint Injury, 2021, 36 (12) : 1284-1286. DOI: 10.7531/j.issn.1672-9935.2021.12.016.
- [21] 叶小东, 黄家谷, 王小勇. 人工髋关节置换术治疗老年陈旧性股骨粗隆间骨折疗效观察 [J]. 中国骨与关节损伤杂志, 2021, 36 (12) : 1287-1288. DOI: 10.7531/j.issn.1672-9935.2021.12.017.
- Ye XD, Huang JY, Wang XY. Observation on the efficacy of artificial hip arthroplasty in the treatment of old intertrochanteric femur fracture in the elderly [J]. Chinese Journal of Bone and Joint Injury, 2021, 36 (12) : 1287-1288. DOI: 10.7531/j.issn.1672-9935.2021.12.017.
- [22] 郭团茂, 曹伟宁, 马航, 等. 人工股骨头置换修复高龄不稳定型股骨粗隆间骨折的疗效 [J]. 国际骨科杂志, 2018, 39 (1) : 54-58. DOI: 10.3969/j.issn.1673-7083.2018.01.013.
- Guo TM, Cao WN, Ma H, et al. Efficacy of artificial femoral head replacement for repairing unstable intertrochanteric femoral fractures in advanced age [J]. International Journal of Orthopaedics, 2018, 39 (1) : 54-58. DOI: 10.3969/j.issn.1673-7083.2018.01.013.
- [23] 秦宏敏, 刘汉涛, 余东洋. 高龄股骨粗隆间骨折手术治疗生存率分析 [J]. 中国矫形外科杂志, 2017, 25 (2) : 123-125. DOI: 10.3977/j.issn.1005-8478.2017.02.06
- Qin HM, Liu HT, Yu DY, et al. Survival rate analysis for femoral intertrochanteric fracture in elderly patients [J]. Orthopedic Journal of China, 25 (2) : 123-125. DOI: 10.3977/j.issn.1005-8478.2017.02.06
- [24] 王雨荷, 刘红, 李艳, 等. 中国原发性骨质疏松症危险因素的 Meta 分析 [J]. 中国骨质疏松杂志, 2021, 27 (12) : 1730-1738. DOI: 10.3969/j.issn.1006-7108.2021.12.003.
- Wang YH, Liu H, Li Y, et al. Meta-analysis of risk factors for primary osteoporosis in China [J]. Chinese Journal of Osteoporosis, 2021, 27 (12) : 1730-1738. DOI: 10.3969/j.issn.1006-7108.2021.12.003.
- [25] 孟凡, 董敏洁, 郭瑾, 等. 社区老年人骨质疏松患病情况及全科防控策略 [J]. 中国全科医学, 2023, 26 (22) : 2778-2784. DOI: 10.12114/j.issn.1007-9572.2022.0171.
- Meng F, Dong MJ, Guo J, et al. Prevalence of osteoporosis in com-

- munity-dwelling older adults and general practice prevention and control strategies [J]. *Chinese General Practice*, 2023, 26 (22): 2778-2784. DOI: 10.12114/j.issn.1007-9572.2022.0171.
- [26] 中国营养学会骨营养与健康分会, 中华医学会骨质疏松和骨矿盐疾病分会. 原发性骨质疏松症患者的营养和运动管理专家共识 [J]. *中华骨质疏松和骨矿盐疾病杂志*, 2020, 13 (5): 396-410. DOI: 10.3969/j.issn.1674-2591.2020.05.002.
- Chinese Society of Nutrition, Bone Nutrition and Health Branch, Chinese Medical Association, Osteoporosis and Bone Mineral Salt Diseases Branch. Expert consensus on nutrition and exercise management in patients with primary osteoporosis [J]. *Chinese Journal of Osteoporosis and Bone Mineral Research*, 2020, 13 (5): 396-410. DOI: 10.3969/j.issn.1674-2591.2020.05.002.
- [27] 杨亚龙, 吴勐, 张朝, 等. 急诊手术治疗高龄股骨粗隆间骨折的疗效分析 [J]. *中国骨与关节损伤杂志*, 2020, 35 (4): 380-382. DOI: 10.7531/j.issn.1672-9935.2020.04.016.
- Yang YL, Wu M, Zhang C, et al. Analysis of the efficacy of emergency surgery in the treatment of intertrochanteric fracture of the femur in advanced age [J]. *Chinese Journal of Bone and Joint Injury*, 2020, 35 (4): 380-382. DOI: 10.7531/j.issn.1672-9935.2020.04.016.
- [28] 徐驰, 周勇, 赵军, 等. PFNA 治疗老年股骨转子间骨折的隐性失血分析 [J]. *中国矫形外科杂志*, 2018, 26 (6): 510-515. DOI: 10.3977/j.issn.1005-8478.2018.06.07.
- Xu C, Zhou Y, Zhao J, et al. Analysis of hidden blood loss in PFNA treatment of inter-trochanteric fracture of the femur in the elderly [J]. *Orthopedic Journal of China*, 2018, 26 (6): 510-515. DOI: 10.3977/j.issn.1005-8478.2018.06.07.
- [29] 葛鸿庆, 黄漫华, 陈文治, 等. 股骨转子间骨折 PFNA 内固定术后隐性失血及其相关因素分析 [J]. *中国矫形外科杂志*, 2015, 23 (24): 2225-2229. DOI: 10.3977/j.issn.1005-8478.2015.24.04.
- Ge HQ, Huang MH, Chen WZ, et al. Analysis of occult blood loss and its related factors after PFNA internal fixation of intertrochanteric femur fracture [J]. *Orthopedic Journal of China*, 2015, 23 (24): 2225-2229. DOI: 10.3977/j.issn.1005-8478.2015.24.04.
- [30] 杜妍. 超声引导选择性腰神经根阻滞加骶丛阻滞在老年髋部手术的应用 [J]. *健康之友*, 2020, (14): 18.
- Du Y. Application of ultrasound-guided selective lumbar nerve root block plus sacral plexus block in elderly hip surgery [J]. *Our Health*, 2020, (14): 18.
- [31] 郑如意, 张海涅, 陈金丛, 等. 全身麻醉和椎管内麻醉对全髋关节置换术效果的影响 [J]. *中国临床保健杂志*, 2023, 26 (3): 355-358. DOI: 10.3969/j.issn.1672-6790.2023.03.015.
- Zheng RY, Zhang HN, Chen JC, et al. Effects of general anesthesia and intrathecal anesthesia on the outcome of total hip arthroplasty [J]. *Chinese Journal of Clinical Health Care*, 2023, 26 (3): 355-358. DOI: 10.3969/j.issn.1672-6790.2023.03.015.
- [32] 张振峰, 邢超越. 不同麻醉方式对老年髋部骨折患者术中生命体征影响的对比研究 [J]. *现代医学与健康研究 (电子版)*, 2023, 7 (4): 45-47. DOI: 10.3969/j.issn.2096-3718.2023.04.015.
- Zhang ZF, Xing CY. Comparative study on the effects of different anesthesia modalities on intraoperative vital signs of elderly hip fracture patients [J]. *Modern Medicine and Health Research (Electronic Edition)*, 2023, 7 (4): 45-47. DOI: 10.3969/j.issn.2096-3718.2023.04.015.
- [33] Laverman CJ, Sierra RJ, Baerga L. Nutritional parameters and short term outcome in arthroplasty [J]. *Am Coll Nutr*, 1999, 18 (3): 274-278. DOI: 10.1080/07315724.1999.10718863.
- [34] Lee HP, Chang YY, Jean YH, et al. Importance of serum Albumin level in the preoperative tests conducted in elderly patients with hip fracture [J]. *Injury*, 2009, 40 (7): 756-759. DOI: 10.1016/j.injury.2009.01.008.
- [35] Musallam KM, Tamim HM, Richards T, et al. Preoperative anaemia and postoperative outcomes in noncardiac surgery: a retrospective cohort study [J]. *Lancet*, 2011, 378 (9800): 1396-1407. DOI: 10.1016/S0140-6736(11)61381-0.
- [36] 柳松, 张德祥. 老年股骨转子间骨折患者股骨近端防旋髓内钉内固定术后颈干角丢失的影响因素分析 [J]. *中医正骨*, 2023, 35 (11): 5-9.
- Liu S, Zhang DX. Analysis of factors affecting the loss of cervical stem angle after proximal femur anti-rotation intramedullary nail internal fixation in elderly patients with intertrochanteric femur fracture [J]. *The Journal of Traditional Chinese Orthopedics and Traumatology*, 2023, 35 (11): 5-9.
- [37] Shen QH, Baik J, Won Y. Assessment of the bone mineral density and microstructure of the human femoral head according to different tip-apex distances can guide the treatment of intertrochanteric hip fractures [J]. *Hip Pelvis*, 2021, 33 (4): 190-199. DOI: 10.5371/hp.2021.33.4.190.

(收稿:2023-09-05 修回:2024-05-31)

(同行评议专家: 付国建, 夏亚一, 汉华)

(本文编辑: 郭秀婷)