Why Fibular Nailing Can Be an Efficient Treatment Strategy for AO Type 44-B Ankle Fractures in the Elderly

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Abstract

The reference standard treatment of unstable AO type 44-B ankle fractures is open reduction and internal fixation. However, delayed-staged surgery because of compromised soft tissues results in prolonged hospitalization and increased total healthcare costs in the elderly (age ≥65 years). The aim of the present study was to measure the efficiency of intramedullary fibular nailing (IMFN) in the elderly. A prospective series of 15 elderly patients with an AO type 44-B ankle fracture treated with IMFN were compared with a retrospective cohort of 97 elderly patients treated with plate and screw osteosynthesis (PSOS). Clinical and process-related variables and total healthcare costs, including 5 cost categories, were assessed. Functional outcomes, general health status, and quality of life were measured using the American Orthopaedic Foot and Ankle Society ankle-hindfoot and EuroQol 5-dimension 3-level visual analog scales. Although the preoperative length of stay was significantly shorter for the patients treated with IMFN, the total length of stay and total healthcare costs were not significantly different between the 2 groups. The complication and reintervention rates were similar in both groups, with improved American Orthopaedic Foot and Ankle Society scale scores in the IMFN group. Compared with delayed-staged surgery, early IMFN led to a significant reduction in total healthcare costs. We could not prove significant cost savings for IMFN compared with PSOS for the treatment of AO type 44-B ankle fractures. However, early IMFN was financially beneficial compared with a delayed-staged (IMFN and PSOS) surgery protocol. Because, ultimately, IMFN allows for early percutaneous fixation in most cases, IMFN is a potentially profitable treatment strategy for AO type 44-B ankle fractures in the elderly with good outcomes.

Introduction

The reference standard for the treatment of an unstable AO type 44-B ankle fracture is still open reduction and internal fixation with plate and screw osteosynthesis (PSOS). Because of compromised soft tissues, complications are not infrequent, with reported complication rates as great as 40% in elderly (1–4). Previously, we reported a complication rate of 29.3% in the elderly (5). In the same study, we conducted an explorative cost analysis and found that the health-care costs for the treatment of AO type 44-B ankle fractures were mainly driven by the hospitalization costs (53%), which are deter-mined by the length of stay (LOS). In turn, the LOS was driven mainly by the use of delayed-staged surgery and patient age. Consequently, the healthcare costs were significantly greater for the elderly.

To reduce the preoperative LOS, we, therefore, have proposed the use of percutaneous intramedullary fibular nailing (IMFN) in the elderly, which allows for early operative treatment, regardless of the quality of the soft tissues. Subsequently, the crude initial costs were significantly lower with IMFN compared with delayed or delayed-staged surgery (6).

The primary goal of the present study was to determine the efficiency of the various treatments of AO type 44-B ankle fractures, comparing percutaneous IMFN in a prospective series of 15 elderly patients (age ≥65 years) and PSOS in a retrospective cohort of elderly patients. In addition, we compared the cost breakdown between patients treated with early IMFN and those treated in a delayed-staged surgery protocol, with either IMFN or PSOS. Furthermore, the clinical and functional outcomes, general health status, and quality of life were assessed. We hypothesized that the total healthcare costs would be decreased with early IMFN in the elderly owing to the decreased preoperative and total LOS, with maintenance of good outcomes.

Patients and Methods

Patients

A prospective series of 15 consecutive patients aged ≥65 years with an acute monotraumatic type AO-44B ankle fracture underwent IMFN (Acumed, Hillsboro, OR) from January 2015 to February 2016. These patients were compared with a retrospective cohort of 97 patients aged ≥65 years with an acute type AO-44B ankle fracture treated with PSOS from January 2009 to June 2014 selected from a retrospective database. Nonacute fractures (diagnosis >4 weeks after the incident), the presence of polytrauma, multiple traumatic events during the follow-up period, a nonfunctional ankle or leg before the incident, and severe neurologic dysfunction (i.e., dementia) were exclusion criteria. All the patients were treated at the trauma surgery department (University Hospitals Leuven). For the patients treated with IMFN, the follow-up visits were at ~6 weeks and 3, 6, and 12 months postoperatively. The follow-up protocol was completed using questionnaires at ~19 months postoperatively. The follow-up visits for the patients treated with PSOS were frequently irregular. The present study was con-ducted in compliance with national legislation and the guidelines of the ethics committee of the University Hospitals Leuven.

Study Variables

A total of 22 clinical and process-related variables were assessed between the first examination and the last clinical visit for the operatively treated ankle fracture. We grouped 16 clinical variables as 5 demographic variables (age, gender, American Society of Anesthesiologists score, body mass index, and other cardiovascular risk factors), 3 fracture-related variables (AO/OTA [Arbeitsgemeinschaft für Osteosynthesefragen/ Orthopaedic Trauma Association] classification, fracture side, and open fracture), and 8 treatment-related variables (interval to definitive surgery, surgery type, use of a syn-desmotic screw, overall complication rate, infection, nonunion, other complications, and reintervention). Other cardiovascular risk factors included diabetes mellitus, hypercholesterolemia, dyslipidemia, arterial hypertension, smoking, alcohol abuse, obesity, and current cardiovascular diseases (e.g., cerebrovascular accident, myocardial infarction, peripheral artery disease). Radiographs or computed tomographic scans were used to identify and classify the fractures according to the AO/OTA classification system (7). The interval to definitive surgery was defined as the time from the first examination until PSOS or IMFN surgery in hours. The surgery type included immediate, delayed, and delayed-staged surgery. Immediate and delayed surgery were defined as operative treatment <24 and >24 hours after the first examination, respectively. Delayed-staged surgery was defined as the use of an external fixator before definitive surgery. The complication rate was defined as the number and percentage of patients who de-veloped ≥1 ankle-related complication during the follow-up period. Surgical site infections, either superficial or deep, were defined in accordance with the Centers for Disease Control and Prevention guidelines (8). Nonunion was defined according to the U.S. Food and Drug Administration guidelines as an incomplete fracture healing within 9 months without radiographic progression toward healing during the previous 3 consecutive months (9). Other complications included wound necrosis, wound dehiscence, screw loosening, loss of reduction, intra-articular hardware, reflex sympathetic dystrophy syndrome, persistent pain at the level of the percutaneous introduction of the nail, and persistent nerve damage. All complications occurring during the entire follow-up period were considered.

We identified 6 process-related variables: LOS to definitive surgery, total LOS, number of operations, number of hospital admissions, number of surgical outpatient admissions, and number of ambulatory consultations.

Outcome Measures

The costs were calculated for all 15 IMFN and 97 PSOS patients from the first ex-amination until the last follow-up visit. Within the study period, all healthcare costs incurred by the traumatology department were considered. These healthcare costs were divided into 5 main categories: honoraria, materials, hospitalization, outpatient ad-mission, and pharmaceutical agents. Honoraria were fee-for-service–based costs related to different medical activities such as surgery, consultations, and imaging studies. The materials costs were the implants, including additional hardware and external fixation when required. Because the fibular nail was not a lump sum reimbursed in Belgium at the time of our study, Acumed sponsored the 15 nails. The cost for the fibular nail and screws was €524 and €27.03, respectively, and were included in our costing model. The hospitalization costs were calculated by the average national day-based care fee of €441, multiplied by the LOS (10). The pharmaceutical agents included all drugs and blood products the patient received during hospitalization. All costs were allocated ac-cording to the prices of 2016. The costs in Euros were converted to U.S. dollars using an exchange rate of 1 U.S. dollar to 0.93 Euro. Our focus was crude cost comparisons, and we did not compute quality-adjusted life-years or incremental cost differences.

The secondary endpoints included the clinical and functional outcomes, general state of health, and quality of life. The functional outcome of the ankle was measured using a Dutch version of the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot questionnaire. This questionnaire focuses on pain, function, and alignment of the ankle, with a total high score of 100. The patients' general state of health was evaluated using a Dutch EuroQol 5-dimension 3-level (EQ-5D-3L) questionnaire. This questionnaire evaluates 5 domains (mobility, self-care, usual activities, pain/ discomfort, anxiety/depression), each with 3 response levels (no problems, some problems, extreme problems). Additionally, the patients were asked to rate their current state of health, representing their quality of life at that moment, using the EuroQol visual analog scale (EQ-VAS), with a score range from 0 to 100, with 100 equaling the best state imaginable.

Statistical Analysis

SPSS, version 24.0 (IBM Corp., Armonk, NY) was used for all statistical analyses. Continuous variables were compared between groups using the Mann-Whitney *U* test. Nominal variables were compared using

Pearson's χ^2 test. A *p* value of < .05 was considered to indicate statistical significance. Additionally, a subgroup analysis was performed of patients treated early with IMFN versus all patients treated using the delayed-staged approach, with either PSOS or IMFN as definitive surgery.

Results

Patient Characteristics

The clinical and process-related variables are summarized in Table 1. The time to definitive surgery is shown in Fig. 1. The median inter-val to definitive surgery for the patients treated with IMFN was less than one third that for the patients treated with PSOS and had minimal variability. One patient who underwent IMFN was treated with a delayed-staged surgery protocol, resulting in 140.6 hours (~6 days) to definitive surgery since the first examination. This patient was an 84-year-old obese female with severely compromised soft tissues and a trimalleolar ankle luxation fracture.

IMFN was complicated by 1 superficial wound infection. In contrast, in the PSOS group, 13 (14.0%) patients developed a superficial wound infection and 4 (4.3%) developed a deep infection postoperatively. Nonunion was diagnosed in 1 patient after treatment according to a delayed-staged surgery protocol, followed by PSOS. In the IMFN group, 2 patients required reintervention. In 1 patient, the syndesmotic screw was removed because of loosening within 3 months postoperatively, and in another IMFN patient, the nail was removed because of persistent pain at the level of the percutaneous introduction of the nail. Subsequently, owing to progressive talar tilt and high-grade osteoarthritis, tibiotalar fusion was performed in the same patient 15 months after the definitive surgery. Reintervention was required in 32 PSOS patients, including syndesmotic screw removal in 16 (15.1%), total hardware removal in 15 (15.5%), and revision surgery in 3 (3.1%).

No significant differences in the clinical variables were observed between the patients treated early with IMFN and those treated ac-cording to a delayed-staged surgery protocol. The following process-related variables differed significantly between the early IMFN and delayed-staged surgery: preoperative LOS, 1 (range 1 to 1) day versus 10 (range 6.5 to 17.5) days (*p* < .001); total LOS, 8 (range 4 to 9.3) days versus 21 (range 13.5 to 29.0) days (*p* < .001); and number of operations, 1 (range 1 to 1) versus 2 (range 2 to 3; *p* < .001), respectively.

Healthcare Costs

The results of a comparison of the total healthcare costs, 5 cost categories, and relative share between IMFN and PSOS are listed in Table 2. The distribution of total healthcare costs per patient for both IMFN and PSOS is visualized in Fig. 2. The distribution of total healthcare costs per patient for early IMFN, PSOS, and a delayed-staged surgery protocol is shown in Fig. 3. The total healthcare costs, cost categories, and their relative share for early IMFN and delayed-staged surgery were also compared (Table 3).

Functional Outcomes, General Health Status, and Quality of Life

The median follow-up period for the IMFN and PSOS groups was
19 (range 14.5 to 24.5) months and 52 (range 36 to 69) months, respectively (*p* < .001). The AOFAS, EQ-5D-3L, and EQ-VAS scores were registered for 14 patients (93%) treated with IMFN (1 patient died 32 days postoperatively of sudden cardiac death) and 40 patients (41%) treated with PSOS. No statistically significant difference was found in the American Society of Anesthesiologists class or current cardiovascular diseases between the responders and nonresponders. The AOFAS ankle-hindfoot scale,

EQ-5D-3L, and EQ-VAS scores are listed in Table 4. Only a significant functional difference was found in the AOFAS ankle-hindfoot scale score between the 2 groups.

Discussion

The primary goal of the present study was to perform an efficiency analysis of IMFN versus PSOS for the treatment of acute AO type 44-B ankle fractures in the elderly (age ≥65 years). In addition, we compared the cost breakdown between patients treated with early IMFN and those treated according to a delayed-staged surgery protocol. Furthermore, the clinical and functional outcomes, general state of health, and quality of life were assessed.

Despite a significant reduction in the preoperative LOS with IMFN compared with PSOS, the total LOS remained equal in both groups. Because hospitalization was the main driver of total healthcare costs (overall relative share of 60%), no significant difference in total health-care costs was observed between the 2 groups. However, patients treated according to a delayed-staged surgery protocol showed significantly greater total healthcare costs compared with those treated with early IMFN, owing to the significantly longer preoperative LOS and total LOS and greater number of operations. Complications and reintervention rates did not significantly differ between the 2 groups. Patients treated with IMFN had a greater AOFAS ankle-hindfoot scale score compared with those treated with PSOS.

However, we were unable to accomplish a reduction of total LOS with the use of IMFN. In the IMFN group, 1 patient was treated ac-cording to a delayed-staged surgery protocol (total LOS 21 days) and 1 patient experienced complications for which multiple hospital ad-missions were necessary (total LOS 27 days). These led to a distortion of the LOS in the relatively small IMFN group. Moreover, patient and surgeon confounders also played a role. Often, patients cannot immediately return home after surgery owing to inadequate care at home. In Belgium, elderly care depends for an important part on in-formal care provided by the family, rather than institutionalized care. Therefore, hospital discharge is likely to be delayed. However, we could not determine whether early surgery was associated with shorter hospital care. At present, no protocols are available regarding the LOS for operative treatment of ankle fractures.

Although we found a clear tendency toward fewer complications and the need for reintervention in patients treated with IMFN com-pared with PSOS, this did not reach statistical significance owing to the limited number of IMFN patients. The complication and reintervention rates in the PSOS group were in line with those from our previous study and the reported data (1–5). However, White et al have recently reported a significantly lower complication rate (e.g., infection) between IMFN and PSOS, favoring IMFN, in a large prospective cohort study. They found that the use of the fibular nail was slightly less expensive compared with PSOS. Their cost model included the average costs of the implants and treatment of any complications; however, hospitalization (i.e., LOS) costs were not considered. The reintervention rate for IMFN was in accordance with the reported data (4,11).

In general, an important limitation of costing studies is that it is often difficult to generalize the findings to an international scale. This difficulty in generalization is because hospital financing is often country specific. At present, no definitive method for internationally comparing the costs for a specific treatment exists. Belgian hospitals are financed through a mixture of patient copayments, the health insurance system, and the ministry of health (5). Without understanding the intricate details of hospital financing in a specific country, one might come to the erroneous conclusion that a specific treatment is less ex-pensive compared with a country with sufficient funding for the treatment. Time-driven, activity-based costing, as proposed by Kaplan and Porter (12) might be a solution to this problem but requires investments to make treatment costs more transparent and easily measurable.

Honoraria and hospitalization represented the major share for both IMFN and PSOS. This was in accordance with our previous studies (5,13). Despite the greater material costs for IMFN, it only represented a small fraction of the total healthcare costs (11%).

Because IMFN allows for early percutaneous fibular fixation regardless of the quality of the soft tissues, the total LOS and healthcare costs for the patients treated with IMFN were compared with those of the patients treated according to a delayed-staged surgery proto-col. As expected, we observed significantly shorter total LOSs and healthcare costs for IMFN. Therefore, the costly preoperative LOS associated with delayed-staged surgery can potentially be reduced by early IMFN. The question remains, however, to what extent early IMFN can be a surgical alternative to the delayed-staged surgery protocol. In the case of open fractures, luxation, or severe soft tissue impairment, primary external fixation remains the most appropriate approach. In the present study, 1 patient (6.7%) was treated according a delayed-staged surgery protocol, with IMFN as the definitive fixation method. This case involved a trimalleolar ankle luxation fracture with severely compromised soft tissues. Surprisingly, only 16.5% of all patients treated with PSOS were treated according to this delayed-staged surgery protocol. Because no significant difference was found in the frequency of delayed-staged surgery between patients treated with IMFN and PSOS, the added value of early IMFN as an alternative treat-ment for delayed-staged surgery seems to be restricted. However, the number of patients treated with IMFN was relatively small.

The median AOFAS ankle-hindfoot scale score was significantly greater in the IMFN group, indicating good functional outcomes post-operatively. However, the general health status (EQ-5D-3L) and quality of life (EQ-VAS) scores were equal between the 2 groups. The AOFAS ankle-hindfoot scale scores for the patients treated with PSOS were in line with those previously reported (2,14). Bugler et al (11) re-ported a mean AOFAS ankle-hindfoot scale score of 82.5 for patients treated with IMFN after a mean follow-up period of 6 years. The follow-up time for our study was rather limited and was significantly shorter for the patients treated with IMFN compared with that for the patients treated with PSOS.

The present study had some more important limitations. First, the study had the observation and measurement, and selection, biases inherent to any retrospective study. Second, the number of patients treated with IMFN was small. Furthermore, the findings of costing studies are difficult to generalize to an international scale. Also, the quality-adjusted life years could not be assessed, because the patients' general health status was measured only once at the end of the follow-up period. Although the questionnaires at the end of the follow-up period were completed by all the patients treated with IMFN, only 41% of the patients treated with PSOS had completed the AOFAS ankle-hindfoot scale, EQ-5D-3L, and EQ-VAS in the retrospective patient cohort. Nevertheless, it was beyond the scope of our study to complete these previously reported questionnaires.

In conclusion, we could not prove a significant financial benefit for IFMN versus PSOS for the surgical treatment of AO type 44-B ankle fractures. Although we successfully reduced the median preoperative LOS, we were unable to shorten the total LOS throughout the study period. Because the LOS was found to be the main driver of the total healthcare costs, the treatment costs for the operative treatment of these ankle fractures did not differ significantly between the IMFN and PSOS groups. To improve efficiency, decrease variability, and reduce total healthcare costs, future evidence-based guidelines regarding the LOS should be established. Nevertheless, an important cost benefit was realized for the patients treated with IMFN compared with those who were treated according to a delayed-staged surgery protocol. Because IMFN ultimately allows for early percutaneous fixation regardless of the quality of the soft tissues in most cases, IMFN can be a profitable treatment strategy for AO type 44-B ankle fractures in the elderly, with maintenance of good outcomes.

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Figures

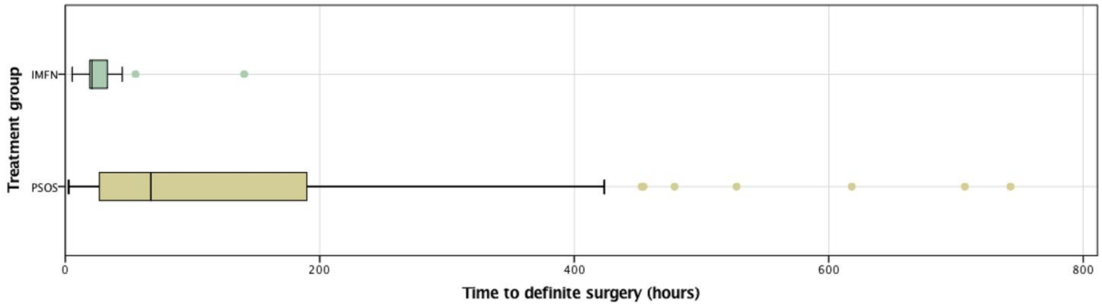

Fig. 1. Comparison of interval to definitive surgery between intramedullary fibular nailing (IMFN) and plate and screw osteosynthesis (PSOS). Box plot showing median interval to definitive surgery for IMFN (n = 15; median 21.0 [interquartile range 18.3 to 39.7]; mean 32.5 ± 21.0 hours) versus PSOS (n = 97; median 67.3 [interquartile range 26.7 to 190.1; mean 141.9 ± 67.3 hours). The time to definitive surgery was significantly shorter for patients treated with IMFN (*p* = .001).

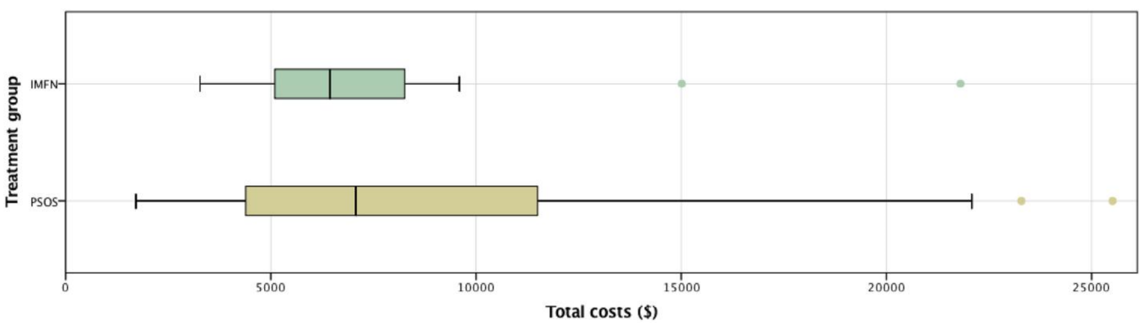

Fig. 2. Comparison of total healthcare costs between intramedullary fibular nailing (IMFN) and plate and screw osteosynthesis (PSOS). Box plot showing median total healthcare costs in U.S. dollars per patient for IMFN (n = 15; median $6444 [interquartile range $4817 to $8322], mean $7765 ± $4837) versus PSOS (n = 97; median $7071 [interquartile range $4338 to $11,565], mean $9311 ± $7646). Although larger variability was present in the total healthcare costs for the patients treated with PSOS, the total healthcare costs did not differ significantly between the 2 groups (*p* = .729).

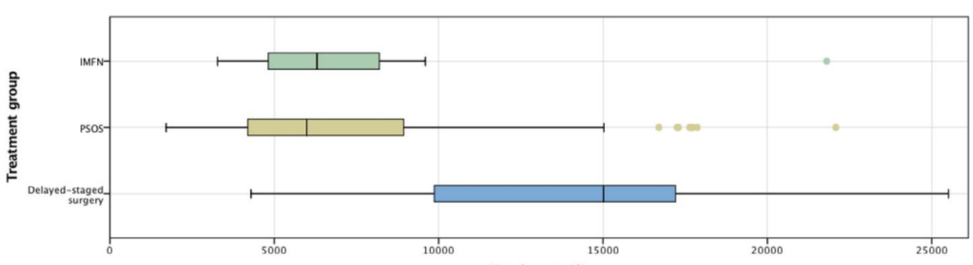

Fig. 3. A comparison of total healthcare costs for early intramedullary fibular nailing (IMFN), plate and screw osteosynthesis (PSOS), and delayed-staged surgery. Box plot showing median total healthcare costs in U.S. dollars. The patients were grouped as early IMFN (n = 14; median $6298 [IQR $4797 to $8228], mean $7248 ± $4568); PSOS (n = 81; median $5985 [interquartile range $4126 to $9014], mean $8309 ± $7575); and delayed-staged surgery (n = 17; median $15,014 [interquartile range $9729 to $18,020], mean $14,422 ± $5752). The total healthcare costs differed significantly (*p* < .001) between the patients treated with IMFN and those treated according to a delayed-staged surgery protocol.

Tables

Table 1 Clinical and process-related variables (n = 112)

Variable	IMFN (n = 15)		PSOS (n = 97)		*p* Value
Age (y)	75	(67 to 81)	73	(69 to 79)	.821
Gender					.788
Male	5	(33.3)	29	(29.9)	
Female	10	(66.7)	68	(70.1)	
ASA score					.017*
1	0	(0.0)	11	(12.0)	
2	7	(46.7)	62	(67.4)	
3	8	(53.3)	19	(20.7)	
BMI (kg/m^2)	28.0	(23.9 to 31.2)	26.4	(23.9 to 29.4)	.510
CVRF	15	(100)	87	(90.6)	.216
AO/OTA classification					.668
44-B1	5	(33.3)	22	(22.7)	
44-B2	7	(46.7)	52	(53.6)	
44-B3	3	(20.0)	23	(23.7)	
Fracture side					.338
Left	8	(53.3)	39	(40.2)	
Right	7	(46.7)	58	(59.8)	
Open fracture	1	(6.7)	1	(1.0)	.125
Time to definitive surgery (h)	21.0	(18.3 to 39.7)	67.3	(26.7 to 190.1)	.001†
Type of surgery					.001†
Immediate (<24 h)	10	(66.7)	20	(20.6)	< .001‡
Delayed	4	(26.7)	61	(62.9)	.008†
Delayed-staged	1	(6.7)	16	(16.5)	.324
Syndesmotic screw	15	(100)	18	(19.1)	< .001‡
Complication rate	2	(13.3)	27	(29.0)	.203
Infection	1	(6.7)	17	(18.3)	.263
Nonunion	0	(0.0)	1	(1.7)	.678
Other	2	(13.3)	16	(17.2)	.709
Reintervention rate	2	(13.3)	32	(33.0)	.123
LOS to definitive surgery (days)	1	(1 to 1)	2	(1 to 6.5)	.043*
Total LOS (days)	8	(4 to 10)	8	(4 to 15)	.523
No. of operations	1	(1 to 1)	1	(1 to 2)	.028*
No. of hospital admissions	1	(1 to 1)	1	(1 to 2)	.066
No. of surgical outpatient admissions	0		0		.151
No. of ambulatory consultations	5	(4 to 6)	4	(2 to 6)	.098

Table 2
Comparison of healthcare cost categories for intramedullary fibular nailing (n = 15) and plate and screw osteosynthesis (n = 97)

Category	Costs per Patient ($)		Total Costs ($)		Relative Share (%)		*p* Value
	IMFN	PSOS	IMFN	PSOS	IMFN	PSOS	
Honoraria	1925 (1668 to 2459)	1996 (1465 to 2738)	36,483	227,150	31	25	.635
Materials	703 (682 to 789)	456 (300 to 569)	12,308	55,045	11	6	< .001*
Hospitalization	3794 (1897 to 4742)	3794 (1897 to 7113)	62,594	544,999	54	60	.584
Outpatient stay	0	0	33	11,555	0	1	.031†
Pharmaceutical agents	231 (217 to 363)	405 (310 to 795)	5052	64,453	4	7	< .001*
Total cost	6444 (4817 to 8322)	7071 (4339 to 11,565)	116,473	903,202	100	100	.729

Table 3

Healthcare costs comparison of early intramedullary fibular nailing (n = 14) versus delayed-staged surgery (n = 17). Data presented as median cost per treatment (interquartile range) for per patient costs.

Abbreviations: IMFN, intramedullary fibular nailing; PSOS, plate and screw osteosynthesis.

* $p \le .01$.

† $p < .001$.

Category	Costs per Patient ($)		Total Costs ($)		Relative Share (%)		*p* Value
	IMFN	Delayed-Staged Surgery	IMFN	Delayed-Staged Surgery	IMFN	Delayed-Staged Surgery	
Honoraria	1877 (1624 to 2444)	2946 (2180 to 3579)	33,125	49,895	33	20	.057
Materials	692 (682 to 789)	1013 (888 to 1057)	11,039	15,974	11	7	.005*
Hospitalization	3794 (1897 to 4386)	9958 (6147 to 12,442)	52,635	165,291	52	67	<.001†
Outpatient stay	0	0	33	1902	0	1	.095
Pharmaceutical agents	230 (216 to 303)	488 (401 to 948)	4623	12,108	5	5	<.001†
Total costs	6298 (4797 to 8228)	15,014 (9729 to 18,020)	101,459	245,169	100	100	<.001†

Table 4

Postoperative functional outcomes, general health status, and quality of life (n = 54)
Data presented as n (%) for categorical variables and as median (interquartile range) for continuous variables.

Abbreviations: AOFAS, American Orthopedic Foot and Ankle Society; EQ-5D-3L, EuroQol 5-dimensions, 3-levels; EQ-VAS, EuroQol visual analog scale; IMFN, intramedullary fibular nailing; PSOS, plate and screw osteosynthesis.

* $p \le .01$ ($p < .05$ considered statistically significant).

Variable	IMFN (n = 14)	PSOS (n = 40)	*p* Value
AOFAS ankle-hindfoot scale score	94 (86 to 100)	84 (64 to 90)	.004*
EQ-5D-3L			
Mobility			.722
No problems	8 (57.1)	19 (47.5)	
Some problems	6 (42.9)	20 (50.0)	
Extreme problems	0 (0.0)	1 (2.5)	
Self-care			.457
No problems	9 (64.3)	32 (80)	
Some problems	4 (28.6)	7 (17.5)	
Extreme problems	1 (7.1)	1 (2.5)	
Usual activities			.299
No problems	9 (64.3)	25 (64.1)	
Some problems	5 (35.7)	9 (23.1)	
Extreme problems	0 (0.0)	5 (12.8)	
Pain/discomfort			.537
No problems	6 (42.9)	19 (48.7)	
Some problems	6 (42.9)	18 (46.2)	
Extreme problems	2 (14.3)	2 (5.1)	
Anxiety/depression			.955
No problems	10 (71.4)	29 (72.5)	
Some problems	3 (21.4)	9 (22.5)	
Extreme problems	1 (7.1)	2 (5.0)	
EQ-VAS score	70 (58 to 76)	70 (64 to 80)	.537