MICRO LABS LIMITED

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Dear Doctor,

Greetings from Micro Labs. We are happy to bring you "**Ortho Newscast"** which contains latest and interesting news in the field of Orthopaedics.

This issue contains

- **Comparison of the effect of Bi-cruciate and Posterior Stabilized Total Knee Arthroplasty on osteoarthritic primary knees with flexion contractures**
- **Evaluation of the Impact of Lateral Soft Tissue Release in Percutaneous Hallux Valgus Correction- A Medium-Term Retrospective Analysis**
- **Clinical efficacy of Novel Sternoclavicular Hook Plate for Treating Posterior Sternoclavicular Dislocation**
- **Ilizarov femur lengthening with the use of bioactive degradable intramedullary implant**

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Comparison of the effect of Bi-cruciate and Posterior Stabilized Total Knee Arthroplasty on osteoarthritic primary knees with flexion contractures

INTRODUCTION

KNEE OSTEOARTHRITIS

The BCS group showed a significant improvement in postoperative flexion contracture

Flexion contracture is a prevalent deformity observed in total knee arthroplasty (TKA). While many deformities are mild and can be corrected passively during surgery, severe fixed deformities necessitate surgical correction. This involves releasing contracted soft tissues and appropriately addressing femoral bone resection.[1] Despite using various treatments for intraoperative extension, preoperative flexion contractures often persist after TKA. Large posterior protrusion in femoral implants, as noted by Onodera et al., can lead to shortened posterior soft tissues and a susceptibility to flexion contractures. The need to further reduce posterior protrusion was crucial in TKA for knees with flexion contractures. In conventional TKA, the anterior cruciate ligament (ACL) remains detached and uncompensated, contributing to poor outcomes. Bellemans et al. introduced a bi-cruciate stabilized (BCS)-type TKA in 2005, compensating for the ACL and promoting normal knee motion, medial pivot, and femoral roll-back. The BCS-type TKA's tibial post engages with the anterior-cam of the femoral component to guide the femur forward during knee extension—a feature lacking in models without an ACL compensating mechanism, such as PS-type TKA.[2] This study explored the impact of BCS-type TKA in comparison to posterior stabilized (PS)-type TKA on primary osteoarthritic knees presenting with flexion contractures.

METHODS

A retrospective study design was employed to assess the clinical outcomes, radiological evaluations, and the extent of additional distal femoral osteotomy during TKA. Between January 2014 and December 2020, a total of 59 knee osteoarthritis surgeries (TKAs) were performed. This comprised 30 PS-type TKAs (NexGen LPS-flex®) with an average age of 76.3 years and BMI of 27.5, and 29 BCS-type TKAs (Journey II®) with an average age of 72.5 years and BMI of 28.6. Full extension was achieved intraoperatively in all TKAs. Inclusion criteria involved knee osteoarthritis with medial involvement, a preoperative flexion contracture of at least 15°, and complete manual intraoperative knee extension. The mean follow-up duration was 48.3 ± 16.4 months for the PS-type TKA group and 19.7 ± 10.3 months

for the BCS-type TKA group. The Knee Society Score (KSS) and joint range of motion (ROM) at preoperative and postoperative observations were used to measure clinical outcomes.

RESULTS

Both groups experienced a significant improvement in range of motion (extension/flexion) following TKA. While there was no significant difference in preoperative flexion contracture between the two groups ($p = 0.28$), the BCS group exhibited a significantly lower postoperative extension angle compared to the PS group ($p = 0.04$). At the last observation, full extension was achieved in 33% (10 knees) of the PS group and 62% (18 knees) of the BCS group. Residual contractures of 15° or greater were present in 10% (three knees) of the PS group and 6.9% (two knees) of the BCS group. Both groups showed a significant improvement in Knee Society Score (KSS) after TKA. Radiographic evaluation revealed significantly enhanced standing frontal tibial angle (FTA) in both groups, with no notable differences in femoral and tibial component positions between the two groups. The posterior offset ratio in the BCS group was significantly smaller than in the PS group. There was no significant difference in posterior condylar offset (PCO) between the two groups (Table 1). Additional distal femoral osteotomies were performed to secure the extension gap, with the PS group undergoing 4 mm osteotomies in 37% (11 cases), 2 mm in 53% (16 cases), and 0 mm in 10% (3 cases). In the BCS group, the corresponding figures were 21% (6 cases), 48% (14 cases), and 31% (nine cases). The mean additional distal femoral osteotomy was 2.5 ± 1.3 mm (ranging from 0 to 4 mm) in the PS group and 1.8 ± 1.4 mm (ranging from 0 to 4 mm) in the BCS group, with the BCS group showing significantly less distal femoral osteotomy ($p = 0.04$).

Table 1. Radiological evaluation

	PS (n = 30)	BCS (n = 29)	p value
Standing FTA			
Pre	185.2° ± 8.8°	187.5° ± 5.5°	n.s
Post	175.9° ± 2.9°	175.5° ± 3.0°	n.s
Implant position			
α	97.2° ± 2.3°	95.9° ± 1.5°	n.s
β	87.7° ± 1.7°	88.0° ± 2.2°	n.s
γ	3.4° ± 1.9°	2.9° ± 3.6°	n.s
δ	85.8° ± 1.9°	87.3° ± 1.8°	n.s
posterior offset ratio	22.2 ± 3.9%	5.2 ± 2.7%	p < 0.001
PCO(pre/post)	29.0 mm/29.7 mm	28.4 mm/29.5 mm	n.s

DISCUSSION

The study found a significantly lower amount of distal femoral osteotomy in the BCS group compared to the PS group. This implies that a BCS-type TKA may enhance the attainment of an extension gap by minimizing the need for distal femoral osteotomy. Leie MA et al. observed that in knees with preoperative flexion contractures of 5° or more, choosing a cruciate-retaining implant with a posterior condyle 2 mm thinner than the osteotomy of the posterior condyle

corrected intraoperative flexion contractures by an average of 3.5°. Additionally, they emphasized that posterior femoral protrusion was an independent variable influencing the securement of the extension gap.[3] In contrast to PS-type TKAs, BCS-type TKAs feature both anterior and posterior cams, aligning the anterior-posterior relationship between the femur and tibia more closely with that of a normal knee. Tomite et al. conducted a study comparing the posterior offset ratio in extended knee position between BCS-type and PS-type TKAs, reporting that the anterior-posterior positioning of the femur and tibia closely resembled that of a normal knee in BCS-type TKAs. Despite the smaller posterior offset ratio observed in the BCS group in the current study and no change in PCO between the two groups pre- and postoperatively, the BCS group exhibited less postoperative flexion contracture. This suggested that the protrusion of the posterior femoral condyle from the posterior margin of the tibial component was smaller in the BCS-type TKA during knee extension compared to the PS-type TKA, influencing the ability to achieve an appropriate extension gap.[4]

CONCLUSION

While there was no notable discrepancy in KSS between the two groups, the BCS group showed a significant improvement in postoperative flexion contracture. The effectiveness of BCS-type TKA in addressing preoperative flexion contracture was evident, requiring a smaller distal femoral osteotomy. This efficacy was attributed to the presence of the anterior cam, which reduced the protrusion of the posterior femoral implant during knee extension, distinguished it from PS-type TKA.

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Evaluation of the Impact of Lateral Soft Tissue Release in Percutaneous Hallux Valgus Correction- A Medium-Term Retrospective Analysis

INTRODUCTION

Hallux valgus (HV) is a prevalent foot deformity leading to bunions and challenges in wearing footwear, impacting individuals across various age groups. In recent times, increased emphasis

The LSTR method on percutaneous HV correction appears to enhance postoperative joint stiffness with a similar rate of recurrence and a low rate of complications.

has been placed on HV research, primarily directed toward understanding the condition's pathogenesis and clinical management. The primary pathological alterations in HV involve osteophytes and the thickening of the articular capsule.[1] The literature encompasses a diverse range of bony procedures for HV, involving osteotomies at the head, midshaft, and base of the first metatarsal, as well as arthrodesis of the first metatarsal-cuneiform joint. Surgical treatments may or may not include lateral soft tissues release (LSTR). Managing HV surgically remains challenging due to the pathology's complexity and the absence of a surgical gold standard. Currently, minimally invasive surgery (MIS) involves small skin incisions (1-3 mm), intraoperative X-ray guidance, and may or may not include internal fixation. The choice between percutaneous HV correction and open surgery were not widely accepted among orthopedic surgeons. The percutaneous technique involves Reverdin-Isham percutaneous osteotomy for first ray alignment and distal metatarsal articular angle (DMAA) correction, achieved through an intra-articular medial closing wedge osteotomy of the distal metatarsal, coupled with an Akin osteotomy. This procedure, performed without osteosynthesis, supports early weight bearing, promoting proper toe position during the healing of the osteotomy.[2] No prior study has examined the long-term outcomes of MIS technique for hallux valgus. This prospective study intended to assess the radiographic and clinical results in patients with mild-to-severe HV treated with MIS, specifically Reverdin-Isham and Akin percutaneous osteotomy after exostectomy and LSTR. Further, the study aimed to determine the impact of LSTR on percutaneous HV correction, assessing both functional and radiographic outcomes.

METHODS

This retrospective study included 396 patients with mild to moderate symptomatic HV treated using the MIS technique from January 2012 to May 2016. Internal fixation was not utilized. Patients were categorized into the LSTR group and the no LSTR group (LSTR N). LSTR was selectively performed for inadequate HV angle (HVA) correction during fluoroscopic control. Inclusion criteria involved patients with mild to moderate painful HV after at least 6 months of unsuccessful conservative treatment. Mild to moderate bunions, concurrent deformities in the lesser toe requiring additional correction, and Distal Minimally Invasive Metatarsal Osteotomy (DMMO) were considered. Previous contralateral HV correction or bilateral deformities were not excluded. Clinical evaluations occurred preoperatively, 6 months postoperatively, and at a 48-month follow-up. American Orthopaedic Foot and Ankle Society (AOFAS) and visual analog scale (VAS) scores assessed pain and function. Complications, relapses, joint range of motion (ROM), and radiological parameters (HVA, intermetatarsal angle) were recorded. Patient satisfaction was gauged, and statistical analyses employed Student t-test and Fisher exact test.

RESULTS

The preoperative, 6-month, and last follow-up values for hallux valgus parameters and clinical outcomes were shown in Table 1. Group comparisons revealed no significant differences in preoperative HVA, IMA, ROM, AOFAS, and VAS values. However, a significant difference was observed in ROM between groups at 6 months and the last follow-up. No differences were found in HVA and IMA at 6 months and the last follow-up, AOFAS at 6 months and the last follow-up, and VAS at 6 months and the last follow-up. Non-union and metatarsalgia rates did not significantly differ between groups. Complications occurred in approximately 9% of patients, with no significant differences between LSTR Y and LSTR N groups. Reported complications included superficial and deep infections, consolidation delays, pseudoarthrosis, impingement with soft tissues, HV recurrence, joint stiffness, and transfer metatarsalgia. Interventions and treatments were implemented based on specific complications reported.

Table 1. Primary radiological and clinical characteristics of the study participants preoperatively, after six months, and at the final follow-up

	Preoperatively		6 months		Last follow-up	
	Soft tissue release	**No soft tissue release**	**Soft tissue release**	**No soft tissue release**	**Soft tissue release**	**No soft tissue release**
HVA	22.4 ± 5.26	22.74 ± 5.5	11.11 ± 2.01	11.22 ± 1.86	12.06 ± 1.39	12.07 ± 1.32
IMA	12.6 ± 1	12.61 ± 0.98	8.14 ± 1.36	8.18 ± 1.33	8.930 ± 1.35	8.99 ± 1.34
ROM	101.94 ± 9.64	102.46 ± 9.9	104.47 ± 7.9	106.28 ± 7.24	104.70 ± 6.07	105.96 ± 6.4
AOFAS	68.08 ± 8.51	67.95 ± 8.17	88.95 ± 8	88.79 ± 8	90.58 ± 6.3	90.37 ± 6.41
VAS	4.41 ± 1.12	4.42 ± 1.14	1.28 ± 1.01	1.39 ± 0.99	0.93 ± 0.76	0.99 ± 0.74

DISCUSSION

This study affirmed that percutaneous HV correction was a reliable and safe procedure, leading to significant improvements in the AOFAS score and radiological angles. The LSTR group exhibited a low risk of recurrence. The study concluded that LSTR in percutaneous HV correction might contribute to postoperative joint stiffness, yet it maintained a comparable relapse incidence and a low complication rate. Lucattelli G et al. supported the effectiveness of the percutaneous technique without internal fixation, providing lasting results in HV correction with notable improvements in function and pain reduction. AOFAS global score and individual parameters demonstrated substantial improvement from pretreatment to the latest follow-up. The study reported a total of 19 complications, constituting 9.7% of cases.[3] Based on Izzo et al., no significant differences were observed in AOFAS and recurrence rates between procedures. However, the LSTR N group showed better ROM at follow-up, a factor not directly investigated in the meta-analysis.[4]

CONCLUSION

The percutaneous correction of HV stands out as a reliable and safe procedure, bringing about significant improvements in both the AOFAS score and radiological angles. The LSTR group exhibited a low risk of recurrence, with no apparent impact on pathology relapse; crucial

correction of the HVA remains pivotal. This technique's advantages include early weight-bearing, minimal invasiveness, and the absence of internal fixation. Although LSTR appears to contribute to postoperative joint stiffness, the incidence of relapse was comparable, and complications were infrequent. This reinforces the credibility of the minimally invasive surgery without osteosynthesis technique. Executed in a step-by-step fashion, this approach allowed reserving LSTR as the final surgical step, exclusively implementing it when adequate metatarsal-phalangeal joint congruence was not achieved during intraoperative assessment.

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Clinical efficacy of Novel Sternoclavicular Hook Plate for Treating Posterior Sternoclavicular Dislocation

INTRODUCTION

Reversible SCD can be effectively treated with the new sternoclavicular hook plate. With the help of this innovative tool, early joint functional workouts and successful functional recovery were possible.

Sternoclavicular dislocation (SCD) is an uncommon dislocation, accounting for less than 1% of all dislocations in men and 3% of shoulder region dislocations. Posterior SCD is even rare, constituting 3–5% of sternoclavicular joint dislocations. It was first described by Rodrigues in 1843 that posterior SCD was associated with a higher complication rate compared to anterior dislocation.[1] Common surgical treatment methods for SCD include Kirschner wire or wire fixation, plate fixation, medial clavicle resection, and sternoclavicular arthrodesis. However, controversies persist regarding the optimal internal fixation method for posterior SCD. The sternoclavicular hook plate, a designed and developed internal fixation material, offered safe and reliable fixation while preserving the amphiarthrodial function of the sternoclavicular joint. The effectiveness of treating posterior SCD with the sternoclavicular hook plate remains uncertain.[2] In this retrospective analysis, clinical data from 11 patients with posterior SCD treated with the newly introduced sternoclavicular hook plate for internal fixation between June 2011 and May 2022 were examined. The objective was to investigate the clinical efficacy of the sternoclavicular hook plate in managing posterior SCD.

METHODS

This study involved eight men and three women, aged 33–71 years with their characteristics shown in Table 1. Inclusion criteria comprised patients over 18 years with posterior sternoclavicular dislocation confirmed by radiography and computed tomography (CT), closed injury without vascular or nerve damage,

Table 1. Patient characteristics

	Value
Age, means (range), y	54.91 (33–71)
Sex, male/female, n	8/3
Side, left/right SCD	2/9
Time of follow-up, means(range), m	18 (15–24)
Mechanism of injury, n	
Motor vehicle accident	4
Hit by heavy objects	2
Fall by biking	2
Fall from height	1
Fall to the ground	1
Brawl	1

internal fixation using a thoracic locking hook plate, and a follow-up period exceeding 1 year with complete records and imaging data. General anesthesia with endotracheal intubation was administered. The Constant–Murley grading and Rockwood et al. chest lock section scores were utilized for functional assessment, covering pain, daily living ability, range of motion (ROM), strength, muscle strength, daily routine activity limitations, and subjective results. Postoperatively, prophylactic anti-infection therapy was initiated, and reviews included X-rays and CT images. Dressing changes, stitch removal, and shoulder exercises followed a prescribed schedule, with careful avoidance of strenuous activities for 3 months. Regular radiography and CT image reviews were conducted.

RESULTS

All 11 patients were monitored for 12–24 months (average 18.00±3.74 months). The surgical duration ranged from 45 to 75 minutes (mean 59.55±11.06 minutes), with intraoperative blood loss between 22 and 58 mL (average 39.91±11.07 mL). Hospitalization lasted 6–14 days (mean 9.91±3.27 days). Postoperative radiography and CT examinations on the second day revealed successful reduction. All incisions healed without complications, and the healing time ranged from 9 to 13 days (average 10.82±1.54 days). No vascular or nerve injuries, pneumothorax, infections, internal fixation failures, or nerve injuries occurred. Joint healing time spanned 3–4 months (average 3.55±0.52 months). The thoracic hook plates were removed within 12–18 months postoperatively. At 12 months after the operation, the Constant–Murley score was 93.64±9.01, with the pain score at 14.09±2.02, daily living ability at 18.18±2.56, ROM at 36.36±4.80 points, and strength at 25 points. The Rockwood score was 13.36±1.86, including pain at 2.82±0.41, ROM at 2.27±0.65, muscle strength at 3, daily activity restriction at 2.55±0.52, and subjective result at 2.73±0.65. Out of these, nine cases were excellent, one case was good, and one case was fair.

DISCUSSION

The study findings suggested that the innovative sternoclavicular hook plate yielded positive outcomes in addressing posterior sternoclavicular dislocation. Zhang et al. also noted that

employing open reduction and fixation with a sternoclavicular hook plate for traumatic sternoclavicular fracture and dislocation was a safe and relatively straightforward surgical approach, resulted in satisfactory results.[3]

CONCLUSION

The innovative sternoclavicular hook plate demonstrated positive outcomes in treating posterior sternoclavicular dislocation, establishing itself as a convenient and safe internal fixation approach. Additionally, it preserved the micro-motion function and stability of the sternoclavicular joint, enabling patients to engage in early postoperative functional exercises.

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Ilizarov femur lengthening with the use of bioactive degradable intramedullary implant

INTRODUCTION

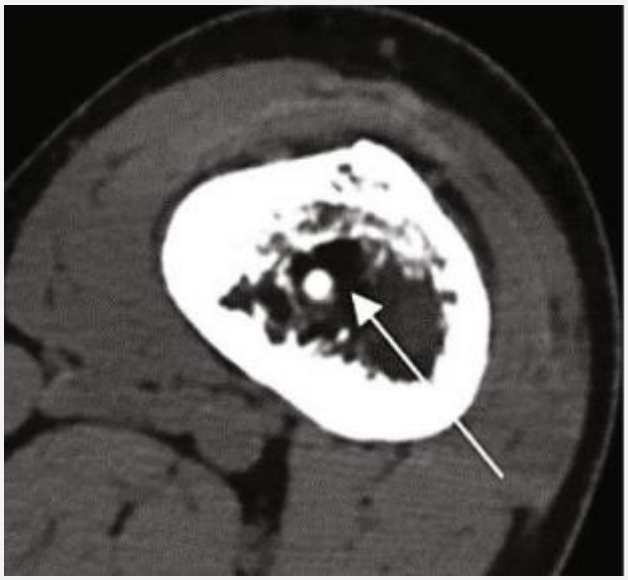
In patients with compromised bone, the combined lengthening technique over a PCL/HA implant may be utilised for faster bone healing and reduce the duration of external fixation.

Circular external fixators, such as the Ilizarov apparatus, was a proven method for lengthening limbs in individuals with conditions like limb length inequality, short stature (especially in cases of achondroplasia), and bone defects. This technique was also applied to enhance the height of individuals without medical conditions who express dissatisfaction with their stature.[1] Despite acknowledging the benefits of the Ilizarov apparatus, orthopedic surgeons encounter unresolved issues related to prolonged external fixation (EF) durations, leading to potential soft-tissue inflammation and patient discomfort in wire or half-pin tracts. The average EF index, ranging from 0.7 to 5.9 months/cm, varies based on factors like age, etiology, affected bone segment, and lengthening magnitude. Consequently, researchers and surgeons were actively exploring methods to shorten the EF period by hastening distraction rates, promoting bone formation, and integrating EF with intramedullary nailing. Efforts persist in seeking ways to stimulate reparative regeneration and reduce EF wearing time, potentially through the application of suitable bioactive degradable intramedullary implants.[2] An instance was provided to demonstrate the application of the biodegradable intramedullary implant,

showcasing a femur lengthening procedure conducted using the Ilizarov frame in combination with this innovative implant.

CASE PRESENTATION

Figure 1. CT following frame removal during the six-month follow-up



This case involving a 10-year-old boy with a 6 cm posttraumatic shortening of the left femur and a 20-degree varus deformity in the distal femoral metaphysis was presented. The injury occurred during football play, and although there were no apparent signs of a fracture, partial epiphysiodesis of the distal femur physis was presumed to have occurred. At age 14, the parents noticed the gradual shortening and angular deformity, leading to a consultation at the hospital. The patient underwent femur lengthening using the Ilizarov technique with an intramedullary degradable polycaprolactone (PCL) implant filled with hydroxyapatite (HA). Regular radiography and monthly bone regeneration control, supplemented by CT after completing the lengthening protocol and removing the Ilizarov frame, revealed no complications. The distraction phase, initiated 7 days post-surgery at a rate of 1-1.5 mm daily, lasted for 60 days. After one month of distraction, bone regeneration filled the gap between fragments, and after 60 days, continuity was maintained, particularly in the intermediary zone around the implant. The Ilizarov apparatus was removed after clinical bone healing confirmation. CT confirmed well-formed cortical layers and well-mineralized central zones of distraction regeneration. The overall EF continued for 90 days for a 6 cm lengthening, resulting in an EF index of 15 days/cm. The limb length became equal, and alignment was satisfactory. Two months post-removal, the patient walked with full weight-bearing on the treated limb and without support. Knee range of motion (ROM) was 0°-60° degrees. A six-month follow-up CT showed a thickened regenerate and a dense cortex, with ongoing intramedullary canal formation (Figure 1). The patient has been monitored for a total of 9 months since the index surgery and 6 months post-EF removal.

DISCUSSION

This case demonstrated the successful application of a bioactive degradable PLC/HA implant alongside the Ilizarov frame for femur lengthening. According to Novikov KI et al., Distraction osteogenesis with the Ilizarov external fixator proved to be a viable choice for specific individuals with short stature seeking height increase.[1] The Ilizarov external fixator was a valuable technique for femoral reconstruction as it enables reduced surgical exposure, preserves bone blood supply, eliminates the need for bone grafting and internal fixation, and facilitates simultaneous lengthening and deformity correction.[3] Over the past five years, there

has been a rising trend in utilizing intramedullary implants for limb lengthening. The study advocated the effectiveness and cost efficiency of employing lengthening over nails as a surgical approach, with motorized intramedullary lengthening nails emerging as the preferred method for femoral lengthening in the last decade.[4]

CONCLUSION

This case demonstrated the successful application of a bioactive degradable PLC/HA implant alongside the Ilizarov frame for femur lengthening. This innovative lengthening approach holds potential clinical and social advantages by reducing the external fixation index compared to the traditional Ilizarov technique and eliminating the need for an additional intervention to remove the implant.

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