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ORIGINAL ARTICLE

Early Surgical Results Using Medial Opening Wedge Osteotomy versus Dome Osteotomy in Hallux Valgus Deformity

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ABSTRACT

Background: A complicated foot positioning deformity known as hallux valgus can cause dysfunction, changed joint mechanics, and progressive discomfort, frequently at the medial eminence of the first metatarsophalangeal (MTP) joint. This study aimed to evaluate which is the best method for treating hallux valgus deformity between the medial opening wedge osteotomy and the dome osteotomy.

Methods: this randomized controlled clinical trial, eighteen patients complaining of hallux valgus deformity after failure of conservative treatment were included in the study to undergo medial opening wedge osteotomy (group I), versus dome osteotomy (group II) for treatment of their hallux valgus deformity, with follow up of 6 months. Preoperative data were collected from the medical records of the patients including both clinical and radiological evaluation, all patients were operated and followed up at the Orthopedic Surgery Department. **Results:** Functional assessment was carried out using the American Orthopaedic Foot and Ankle Society (AOFAS) Score. The mean preoperative score was 46.3±2.7 (range, 43–50) and 44.6±4.1 (range, 40–52) in groups I and II, respectively. At 3-month follow-up, the mean score increased to 80.7±3.4 (range, 77–89) and 81.8±2.4 (range, 78–85) in groups I and II, respectively. At 6-month follow-up, a further increase was observed to mean score of 90.9±2.8 (range, 77–89) and 91.0±3.9 (range, 78–85) in groups I and II, respectively. (Bonferroni test, P<.001).

Conclusions: The two methods of osteotomy seem to be more clinically effective for the management of hallux valgus deformity.

Keywords: Hallux valgus; Wedge Osteotomy; Dome Osteotomy.

INTRODUCTION:

One of the most prevalent abnormalities, affecting more women than men, is Hallux valgus, which is characterized by a big toe lateral deviation, first and second toe widening intermetatarsal angles, and, in extreme cases, a deformity of the second toe **[1]**.

A chronic progressive onset is a common presentation of hallux valgus (HV) deformity. The proximal phalanx pronates and deviates laterally, whereas the first metatarsal head deviates medially and often become red and painful. Patients usually come with deep or intense pain at the MTP joint that has a chronic onset and gets worse when they walk. Periodically, the patient complains of an excruciating ache at the base of the second metatarsal. The frequency, duration, and intensity of discomfort gradually increase with the progression of HV deformity. Patients often report a corresponding rise in the deformity's size. Pain that is either burning or tingling at the dorsal aspect of the deformity is another somewhat typical presentation. The symptoms point to neuritis of the medial dorsal cutaneous nerve, most likely caused by the malformation compressing the nerve. Three distinct processes are mostly responsible for these symptoms: The bunion is focused on the medial aspect of the first metatarsal. more force

applied to the metatarsals bones of the second through fifth and pressure against the superiorly displaced toes **[2].**

Any HV technique aims to balance and correct the initial MTP joint. Plates, screws, or pins are used to support the osteotomy's proximal and distal parts. The radiographic assessment of the deformity's magnitude determines whether a proximal or distal operation should be planned for a periarticular osteotomy. Proximal osteotomies are recommended for more severe deformities with significant IMA, while distal osteotomies are often saved for mild or moderate HV. Typically, moderate to severe deformities are treated using SCARF osteotomy and mild deformities with Chevron osteotomy **[3]**.

The most common treatment done on the proximal first metatarsal is probably the proximal crescentic (Dome) osteotomy. Using a curved saw blade, it is often done about 1 cm distal to the metatarso-cuneiform joint. The osteotomy's crescent may be proximal or distal. A little fragment compression screw is used to secure the distal fragment after it has been moved laterally. K-wire is occasionally added to reduce rotational instability. It is usually possible to mobilize the distal fragment 2 to 3 mm laterally while being careful not to overcorrect the deformity **[4]**.

In addition to treating wedge osteotomy with the medial hole in the hallux valgus is also utilized to execute the adductor tenotomy, make an incision over the dorsal first web space, and release a portion of the intermetatarsal ligament. An adjustment was made. A dorsomedial incision is performed over the first MTP joint, and during the procedure, digital nerves are located and shielded. A small fragment of metatarsal bone is removed during a bunionectomy to raise the capsule flaps. Next, 15 mm is the distance between the first tarsometatarsal joint to the proximal metatarsal osteotomy after the tarsometatarsal joint is detected with a needle using a dorsomedial approach guided by C-arm imaging. The IMA was excellently corrected, and the lateral sesamoid bone was positioned correctly, by gradually widening the wedge until the proper angle was obtained. The size of the wedge is determined by the degree of correction. A medially positioned plate and screws are used for fixation. An auto bone graft is used for augmentation, and it is impacted into the wedge side **[5]**.

Hypothesis:

The medial opening wedge osteotomy and dome osteotomy have high overall satisfaction by patients and is preferred by surgeons, which stems from their straightforward techniques, which makes the techniques a suitable option for correcting the hallux valgus deformity.

Aim the study:

The aim of this study is to evaluate which is the best method for treating hallux valgus deformity between the medial opening wedge osteotomy and the dome osteotomy.

METHODS

The current study was randomized controlled clinical trial study included eighteen patients with hallux valgus deformity who were presented at Orthopedic surgery department of Zagazig University Hospitals from between February 2022 to August 2023. Patients were divided into two groups based on the surgical technique.

Group I: 9 patients included patients undergoing medial opening wedge osteotomy.

Group II: 9 patients included patients undergoing dome Osteotomy.

The Inclusion criteria: age 18-80 years, IMA > 11 degrees, Hallux valgus angle (HVA) > 20 measured by goniometer and we excluded Below skeletal maturity. Patient with neurological disease of the musculoskeletal system. Osteoporosis. Diabetic foot. Mild cases. Patient's refusal.

Indications for surgery:

Indications for surgical treatment were failed conservative treatment of at least six-month duration, with forefoot pain and HVA (hallux valgus angle) > 20. A HVA > 40 was not considered a surgical contraindication to undergoing this modified technique, and patients with osteoarthritis of the first metatarsophalangeal joint or with an IMA (inter-metatarsal angle) > 20 were treated by a different surgical procedure. Patients with a significantly short first metatarsal (Greek foot) with callosities identified under the heads of the lesser metatarsals were also treated by a different surgical technique.

Surgical technique:

Dome Osteotomy: Following dorsal incision, the extensor hallucis longus was retracted. (i.e., about 2.5-3 cm was applied to the fascia and skin), followed by tenotomy of the abductor halluces and opening of the joint capsule with bunion resection. Finally, soft tissue release and exposure of the proximal area of the first metatarsal bone were used to correct the varus deformity by creating multiple holes in the shape of a dome (approximately 1 cm distal to the metatarso-cuneiform joint). To rectify the deformity, a small osteotome is used in the second

phase after many tiny holes are made at the osteotomy site to create a dome shape. Next, 2mm k-wire is used for fixation, and the area is cleaned with regular saline. The operation then finished with removal of tourniquet and good hemostasis, then capsuloraphy with one zero proline (figure 1).

Proline or silk (i.e., two-zero) was used to suture the skin, and the last step was to dress the area with a brief backslap at an angle of 90 degrees to provide protection.

Wedge osteotomy:

A strict sterile approach was used during radiographic planning prior to surgery to assess the size and location of the osteotomy on a plain x-ray. Using a tourniquet above the knee, povidone iodine scraping, and a medial incision of around 3.5 - 4cm to the skin and fascia, the leg was made bloodless while the patient remained supine. The bunion was removed, soft tissue was released, and the first metatarsal bone was exposed to correct the deformity. This was done by using a small osteotome to open a wedge osteotomy that was about 1-1.3 cm from the distal to the metatarso-cuneiform joint. After fixing the wound with 2 mm k-wire and cleaning it with regular saline, the tourniquet was removed, excellent hemostasis was reached, and capsuloraphy was carried out with one zero proline. Lastly, proline or silk skin sutures (i.e., two zero) with dressing and short backslap with toe protection, at 90-degree ankle position (figure 2). In both techniques, a radiographic assessment of hallux valgus angle and inter- metatarsal angle in the antero- posterior view was performed preoperatively and postoperatively.

Postoperative care:

To preserve the K-wire and stabilize the osteotomy, a cast is placed on the toe and a sterile dressing is applied. Initially, Barouk therapeutic footwear the patient is permitted to bear their entire weight immediately. Two weeks following surgery, the sutures are taken out, and the after then, the wound is assessed every two weeks. Following a six-week period, the protective toe cast, and K-wire are removed, and an x-ray is obtained to verify the osteotomy site's bone union. All patients were permitted to go about in cozy footwear.

Follow up:

The follow–up strategy focused on radiological evaluation to determine the union and angles of correction followed up weekly for one month then monthly for six months, clinical assessment for pain range of motion and finally the functional assessment using American Orthopedic Foot and Ankle Socity score (AOFAS score) which developed in 1994, the clinician-based AOFAS covers four different regions of the foot: The ankle-hind foot, midfoot, metatarsophalangeal (MTP)-interphalangeal (IP) for the hallux, and MTP-IP for the lesser toes. These four anatomic regions have their own version of the AOFAS survey. Each one is designed to be used independent of the others. However, each measure is comprised of nine questions and covers three categories: pain (40 points), function (50 points) and alignment (10 points). These were all scored together for a total of 100 points.

Ethical approval:

Written informed consent was collected from each participant, and the Faculty of Medicine's research ethics committee approved the study, Zagazig University, ZU-IRB #10392-25-1-2022. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

STATISTICAL ANALYSIS:

The Shapiro-Wilk test was used to determine whether the data distribution was normal. Using SPSS, the following results were obtained for the quantitative variables means and standard deviation; for the qualitative variables, frequencies, and percentage Version 22.0 (IBM Corp, Armonk, NY). To compare between the treatment groups, the Chi-square test was used for categorical variables, while independent sample t-test was used for numerical variables. P value less than .05 was considered to declare statistical significance

RESULTS:

Table 1; showed that no statistically significant difference was found between groups regarding age distribution (Independent sample t test, P = .163). As demonstrated in **Table 1**, the mean age in group I was 41.9 ± 6.1 years, ranging between 34 and 50 years. In group II, the mean age was 37.4 ± 6.8 years, ranging between 26 and 47 years. No statistically significant difference was found between groups regarding gender distribution (Chi-square test, P = .599). In group I, seven (77.8%) patients were males, and two (22.2%) were females. In group II, six (66.7%) patients were males, three (33.3%) were females Table 1. No statistically significant difference was found between groups regarding side distribution (Chi-square test, P = .629). In group I, three (33.3%) cases were right-sided, and six (66.7%) were left-sided. In group II, four (44.5%) patients were right-sided, five (55.6%) were left-sided

(**Table 1**). No statistically significant difference was found between groups regarding disease severity (Chi-square test, P = .343). As shown in **table 1**, in group I, three (33.3%) cases had moderate deformity, and six (66.7%) had severe deformity. In group II, five (55.6%) patients had moderate deformity, while four (44.4%) had severe deformity.

Table 2; showed that statistically significant improvement was found in terms of AOFAS score from preoperatively to postoperatively (Repeated measure ANOVA, P < .001). By running a post-hoc analysis, a statistically significant difference was demonstrated between preoperative and 3-month scores, preoperative and 6-month scores, and 3- and 6-month scores (Bonferroni test, P < .001). On the other hand, no statistically significant difference was found between the two groups regarding preoperative and postoperative AOFAS scores (Independent sample t test, P > .05).

Table 3; showed that statistically significant improvement was found in terms of HVA and IMA from preoperatively to postoperatively (Paired sample t test, P < .001). On the other hand, no statistically significant difference was found between the two groups regarding preoperative and postoperative HVA and IMA (Independent sample t test, P > .05). Angular correction was assessed using hallux valgus angle (HVA) and inter-metatarsal angle (IMA). As shown in table 3, the mean preoperative HVA was 38.7 ± 1.9 (range, 37 – 42) and 41.3 ± 3.6 (range, 36 – 45) degrees in groups I and II, respectively. Postoperatively, the mean HVA increased to 16.3 ± 1.3 (range, 15 – 18) and 14.9 ± 1.6 (range, 13 – 18) degrees in groups I and II, respectively. In table 3 the mean preoperative IMA was 14.7 ± 1.6 (range, 12 – 16) and 15.0 ± 3.8 (range, 11– 20) degrees in groups I and II, respectively. Postoperatively, the mean IMA increased to 6.7 ± 0.8 (range, 6 – 8) and 7.4 ± 1.9 (range, 5 – 9) degrees in groups I and II, respectively.

Table 4; showed that the mean time to union of osteotomy in group I was 54.2 ± 5.4 days, ranging between 50 and 63 days. In group II, the mean age was 50.3 ± 3.7 days, ranging between 45 and 55 days. 3 cases have delay of union because heavy smoker and chronic disease, 2 cases in group I and 1case in group II. As demonstrated in **tables 4**, the mean time to K-wire removal in group I was 62.7 ± 3.4 days, ranging between 58 and 68 days. In group II, the mean age was 59.9 ± 3.2 days, ranging between 55 and 56 days. No statistically significant difference was found between groups regarding average time to osteotomy consolidation (Independent sample t test, P = 0.093). Also, no statistically significant difference was found between groups regarding average time to K-wire removal (Independent sample t test, P = 0.083).

In terms of postoperative complications **table 5**, superficial wound infection was reported in three (33.3%) patients in group 1, and two (22.2%) patients in Group II. One (11.1%) patient in group I developed oedema postoperatively, whereas oedema was observed in two (22.2%) patients in group II. Varus deformity was observed in two (22.2%) patients in group I and one (11.1%) patient in group II. Recurrence was found in two (22.2%) patients in group I, but no recurrence was recorded in group II. No statistically significant difference was found in rates of infection, oedema, varus deformity or recurrence postoperatively (Chi-square test, P > .05).

Case Presentation:

Case one; Medial opening wedge osteotomy this case has chronic Halux valgus (preoperative) age 35y Rt foot Hallux valgus angle (HVA) = 38°, Inter metatarsal angle (IMA) = 16 **figure 3.** post-operative x-ray, Inter metatarsal angle (IMA) = 6°, Halux valgus angle (HVA) = 15° **figure 4**

Case two: Dome (proximal crescentic) osteotomy this case has chronic Halux valgus (preoperative) age 38 y RT foot with Hallux valgus angle (HVA) = 45°, Inter metatarsal angle (IMA) = 20° **figure 5**. post-operative x-ray, Inter metatarsal angle (IMA) = 9°, Halux valgus angle (HVA) = 14° **figure 6**

Table (1): Patient Demographic Data (N = 18)

	Group I (N = 9)	Group II (N = 9)	P value
Age, years*			.163 [a]
Mean ± SD	41.9 ± 6.1	37.4 ± 6.8	
Range	34 – 50	26 – 47	
Gender**			.599 [b]
Male	7 (77.8%)	6 (66.7%)	

	Group I (N = 9)	Group II (N = 9)	P value
Female	2 (22.2%)	3 (33.3%)	
Side**			.629 [b]
Right	3 (33.3%)	4 (44.4%)	
Left	6 (66.7%)	5 (55.6%)	
Severity*			.343 [b]
Moderate	3 (33.3%)	5 (55.6%)	
Severe	6 (66.7%)	4 (44.4%)	

* Data are presented as mean ± SD; ** Data are presented as frequency (percentage).
[a] Independent sample t test; [b] chi-square test.

Table (2): American Orthopaedic Foot and Ankle Society Score (N = 18)

	Group I (N = 9)	Group II (N = 9)	P value*
Preoperative			.295
Mean ± SD	46.3 ± 2.7	44.6 ± 4.1	
Range	43 – 50	40 – 52	
3-Month Follow-up			.433
Mean ± SD	80.7 ± 3.4	81.8 ± 2.4	
Range	77 – 89	78 – 85	
6-Month Follow-up			.945
Mean ± SD	90.9 ± 2.8	91.0 ± 3.9	
Range	88 – 95	85 – 95	
Preoperative vs 3-Month Follow-up**	< .0001	< .0001	
Preoperative vs 6-Month Follow-up**	< .0001	< .0001	
3-Month vs 6-Month Follow-up**	< .0001	< .0001	

Data are presented as mean ± SD.
* Independent sample t test; ** Repeated Measure ANOVA and Post-hoc test.

Table (3): Hallux Valgus Angle and Inter-Metatarsal Angle (N = 18)

	Group I (N = 9)	Group II (N = 9)	P value*
Hallux Valgus Angle			
Preoperative			.066
Mean ± SD	38.7 ± 1.9	41.3 ± 3.6	
Range	37 – 42	36 – 45	
Postoperative			.054
Mean ± SD	16.3 ± 1.3	14.9 ± 1.6	
Range	15 – 18	13 – 18	
P value**	< .0001	< .0001	
Inter-Metatarsal Angle			
Preoperative			.876
Mean ± SD	14.7 ± 1.6	15.0 ± 3.8	
Range	12 – 16	11– 20	
3-Month Follow-up			.276
Mean ± SD	6.7 ± 0.8	7.4 ± 1.9	
Range	6 – 8	5 – 9	
P value**	< .0001	< .0001	

Data are presented as mean ± SD.
* Independent sample t test; ** Repeated Measure ANOVA and Post-hoc test.
** Paired sample t test.

Table (4): Time to Union and Metal Removal (N = 18)

	Group I (N = 9)	Group II (N = 9)	P value*
Time to Union, days			.093
Mean ± SD	54.2 ± 5.4	50.3 ± 3.7	
Range	50 – 63	45 – 55	
Time to K-wire Removal, days			.083
Mean ± SD	62.7 ± 3.4	59.9 ± 3.2	
Range	58 – 68	55 – 56	

Data are presented as mean ± SD. * Independent sample t test.

Table (5): Postoperative Complications (N = 18)

	Group I (N = 9)		Group II (N = 9)		P value*
	Yes	No	Yes	No	
Infection	3 (33.3)	6 (66.7)	2 (22.2)	7 (77.8)	.599
Oedema	1 (11.1)	8 (88.9)	2 (22.2)	7 (77.8)	.527
Varus Deformity	2 (22.2)	7 (77.8)	1 (11.1)	8 (88.9)	.527
Recurrence	2 (22.2)	7 (77.8)	0 (0)	9 (100)	.134

Data are presented as frequency (percentage). *Chi-square test.

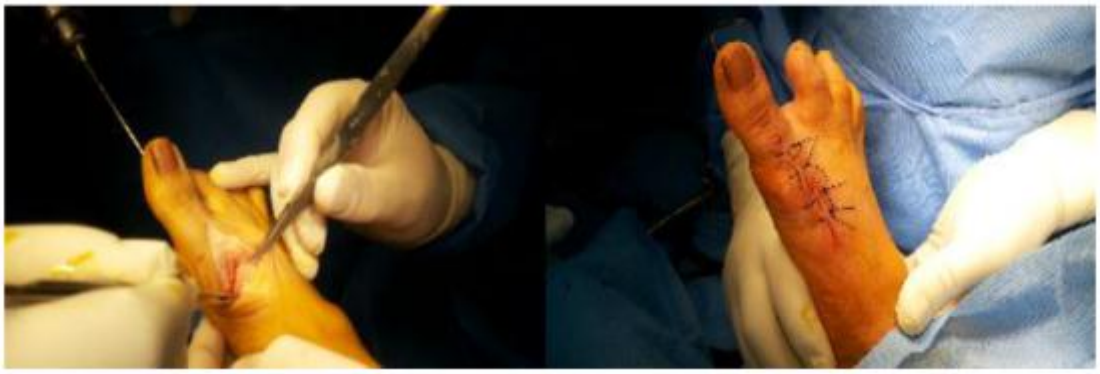

Figure (1): Using 2mm k-wire for fixation.

Figure (2): Removal of sutures after 2 weeks postoperatively

Figure (3): x-ray of chronic hallux valgus (preoperative)

Figure (4): post-operative x-ray, Inter metatarsal angle (IMA) = 6°, Halux valgus angle (HVA) = 15°.

Figure (5): preoperative hallux valgus

Figure (6): After healing (post-operative)

DISCUSSION:

This study showed that the mean age in group I was 41.9 ± 6.1 years, ranging between 34 and 50 years. In group II, the mean age was 37.4 ± 6.8 years, ranging between 26 and 47 years. Age differences did not show any statistically significant differences. Furthermore, we discovered that group I of our investigation revealed that seven (77.8%) patients were males, and two (22.2%) were females. In group II, six (66.7%) patients were males, three (33.3%) were females, there was no significance regarding gender.

This study supported with **Mirza et al [6]** they sought to compare two surgical osteotomy techniques used to treat hallux valgus: the distal wedge metatarsal osteotomy and the distal dome osteotomy. The objective of the assessment was both radiological and clinical.

A total of 36 foot and 28 individuals with a mean age of 50 years old had hallux valgus in their study. This study included three years, with follow-ups every six to thirty months (mean follow-up of 8.8 months). Eighteen feet had wedge osteotomy, and nineteen feet underwent dome osteotomy. Prior to and during surgery, every case was evaluated using the American Orthopedics Foot and Ankle Society (Aofas) score, the intermetatarsal angle, and the hallux valgus angle. Also, this study supported with **Petratos et al [7]** Whose goal was to assess the treatment of teenage hallux valgus by osteotomy of the proximal dome a first metatarsal proximal osteotomy was used to treat hallux valgus in 32 adolescents (27 girls and 5 males). At the time of surgery, the mean age was 14.2 years (range: 11.8 to 15.3).

These results disagree with **Mirza et al [6]** who stated that patients with a female gender had a higher incidence of hallux valgus than those who were male, with a ratio of 9.5:1.

Also, **Coughlin and Jones [8] & Paczesny et al [9]** who reported that females were more common incidence of hallux valgus compared with males.

This study showed that in group I, three (33.3%) cases were right-sided, and six (66.7%) were left-sided. In group II, four (44.5%) patients were right-sided, five (55.6%) were left-sided. Regarding side distribution, there was no discernible statistically significant difference between the groups. According to our research, in group I, three (33.3%) cases had a moderate deformity, and six (66.7%) had severe deformity. In group II, five (55.6%) patients had moderate deformity, while four (44.4%) had severe deformity. Between the groups, there was no statistically significant difference in the disease's severity (Chi-square test, P = .343).

These results agree with **Mirza et al [6]** who reported that in comparison to male cases, female cases were more common roughly 25 patients, of whom six have bilateral feet, compared to 3 male cases, of whom 2 have bilateral feet. More damage was done to the left side, or 20 feet, than the right (16 feet). For 19 feet, the wedge operation was carried out, and for 17 feet, the dome procedure.

This study supported with **Petratos et al [7]** who stated that seven children had bilateral deformities (5 females and 2 males).

This study showed that functional assessment was carried out utilizing the Foot and Ankle Orthopaedic Society (AOFAS) Score. Average preoperative score was 46.3 ± 2.7 (range, 43 – 50) and 44.6 ± 4.1 (range, 40 – 52) in groups I and II, respectively. At 3-month follow-up, the mean score increased to 80.7 ± 3.4 (range, 77 – 89) and 81.8 ± 2.4 (range, 78 – 85) in groups I and II, respectively. At 6-month follow-up, a further increase was observed to a mean score of 90.9±2.8 (range,77–89) and 91.0 ± 3.9 (range, 78 – 85) in divisions I and II, accordingly. A statistically significant difference between the preoperative three-month and six-month follow-ups was not seen. According to this study, the AOFAS score improved statistically significantly from the preoperatively to postoperatively (Repeated measure ANOVA, P < .001). By running a post-hoc analysis, a statistically significant distinction between the preoperative and 3-month scores, preoperative and 6-month scores, and 3- and 6-month scores (Bonferroni test, P < .001) and show When comparing the preoperative and postoperative AOFAS scores of the two groups, no statistically significant difference was discovered (Independent sample t-test, P > .05).

Mirza et al [6] who reported that by dome osteotomy we have 94.7% satisfactory or good results (18 out of 19 feet) and 5.3% of not good results i.e unsatisfactory (1 foot)., Between the pre- and postoperative periods, for dome osteotomy, the mean AOFAS score rose from 45.7 to 82.83 points. With the use of wedge procedure, there is a considerable clinical improvement in both radiological assessment and AOFAS score. Between the pre- and postoperative periods with dome osteotomy, the mean AOFAS score rose from 45.7 to 82.83 points. With the use of wedge procedure, there is a considerable clinical improvement in both radiological assessment and AOFAS score. ($p<0.05$) both sets of data indicated. Thus, when compared analytically, the radiological outcome and clinical (AOFAS) score of the two types of procedures are similar. The dome osteotomy produced more favorable outcomes. (i.e. around 94.7%), while that of the wedge osteotomy showed lower results (i.e. around 82.8 %). The mean AOFAS score increased significantly after both operations, with dome osteotomy showing a better result.

Kannegieter Kilmartin [10] they stated that the typical AOFAS score after hallux varus correction surgery was 74. AOFAS Scores were not taken before the revision operation, but they were taken six months after the initial hallux valgus procedure, at which the average score was 89 out of a possible 100 points. Participant

four experienced the biggest decline in AOFAS scores, going from 90 to 55.

This study showed that the inter-metatarsal angle (IMA) and the hallux valgus angle (HVA) were utilized to assess angular correction. Before surgery, the average HVA was 38.7±1.9 (range, 37 – 42) and 41.3 ± 3.6 (range, 36 – 45) degrees in groups I and II, respectively. Postoperatively, the mean HVA increased to 16.3 ± 1.3 (range, 15 – 18) and 14.9 ± 1.6 (range, 13 – 18) degrees in groups I and II, respectively. The mean preoperative IMA was 14.7 ± 1.6 (range, 12 – 16) and 15.0 ± 3.8 (range, 11– 20) degrees in groups I and II, respectively. Postoperatively, the mean IMA increased to 6.7 ± 0.8 (range, 6 – 8) and 7.4 ± 1.9 (range, 5 – 9) degrees, respectively, in groups I and II. HVA and IMA showed a statistically significant improvement from the preoperative to the postoperative periods. (Paired sample t test, P < .001). But there was no statistically significant difference between the two groups' preoperative and postoperative IMA and HVA. (Independent sample t test, P > .05).

This study supported with **Mirza et al [6]** who stated that the mean IMA and HVA were 11.7o and 33.2º before surgery, respectively, declining to 7º IMA and 14.3º HVA in the recovery phase. Both sets of data demonstrated that this therapy significantly improved the radiological and clinical aspects of (AOFAS). (p<0.05) Within the wedge osteotomy group, the proportion of favorable or well-performing outcomes was 88.2% (15 feet) out of 17 while unsatisfactory or not good results represented 11.8% (two feet).

Mann and Coughlin [11] &Thomas and Schroth [12] both surgical procedures have similar results in the clinical and radiological outcome with nearly similar p value.

Wagner et al[13] who aimed to evaluate the clinical and radiological results at midterm for patients treated with this kind of plate-fixed proximal osteotomy. According to their findings, the average HV angle following surgery was 12.3 degrees, IM angle 4.8 degrees, AOFAS score 89 points. The mean decrease in the first metatarsal length was 2.2 mm (range, 0-8).

Pappas et al [14] who reported that no statistically significant difference was found between the two groups regarding preoperative and postoperative HVA and IMA**.**

Kannegieter Kilmartin [10] they sought to evaluate the effectiveness of reverse scarf in combination with proximal phalanx opening wedge osteotomy for the treatment of iatrogenic hallux varus. The AOFAS scores, patient satisfaction, the rationale for the revision surgery, and an assessment of the intermetatarsal (IM) and first metatarso-phalangeal joint were all examined in the five patients who were present for the retrospective audit (MTPA) angles. The mean initial MTP joint angle was 5◦ and the mean IM angle was 5◦ prior to revision to address hallux varus was −10◦. Following revision surgery, the angles improved to a mean IM angle of 9◦ and first MTP joint angle of 10.7◦.

This study showed that in group I, the average duration to union of the osteotomy was 54.2±5.4 days, with a range of 50 and 63 days. In group II, the mean age was 50.3 ± 3.7 days, ranging between 45 and 55 days., the mean time to K-wire removal in group I was 62.7 ± 3.4 days, ranging between 58 and 68 days. In group II, the mean age was 59.9 ± 3.2 days, with a range of 55 to 56 days. Regarding the average time to osteotomy consolidation, the groups did not differ significantly statistically (Independent sample t test), P =.093). Additionally, For K-wire removal, there was no statistically significant difference between the groups' average timeframes. (Independent sample t-test, P = .083).

This study supported with **Mirza et al [6]** who stated revealed the average amount of time needed to remove the K-wire for each group was the same, with no statistically significant difference. **Kannegieter Kilmartin [10]** who stated that it took an average of 48 months from hallux valgus surgery to revision surgery to address hallux varus (range14–105; S.D. 38.1).

According to this investigation, three cases of superficial wound infection were recorded as postoperative sequelae (33.3%) patients in group 1, and two (22.2%) patients in Group II. One (11.1%) patient in group I developed oedema postoperatively, whereas oedema was observed in two (22.2%) patients in group II. Varus deformity was observed in two (22.2%) patients in group I and one (11.1%) patient in group II. Recurrence was found in two (22.2%) patients in group I, but group II showed no signs of recurrence. There was no discernible variation in the rates of infection, oedema, varus deformity, or recurrence following surgery (Chi-square test, P > .05).

This study supported by **Mirza et al [6]** stated that around 21% of foot issues were discovered in the dome osteotomy group, with one patient for each complication. These complications

included wound dehiscence in one patient, overcorrection (i.e., hallux varus) in one patient, and delay union in two patients. There were only a few problems in the wedge osteotomy group, and one patient experienced postoperative pain. For both two surgical techniques, there is no reduced metatarsophalangeal joint movement or wound infection.

Petratos et al [9] they concluded that the first metatarsal proximal crescentic osteotomy is a dependable and successful procedure. The duPont bunion rating score served as the basis for the post-operative assessment. The result was excellent in 11 feet, good in 22 cases, Poor in one case and fair in five. A good outcome was obtained in 35 feet using the subjective duPont score criteria of cosmesis and discomfort (90%).

Also, **Wagner et al [9]** who stated that revision procedures were necessary for twelve foot (6.4%) where the abnormality had returned. In 23 feet, full or partial hardware removal was required (12.3%) for symptomatic hardware. Five feet (2.6%) developed hallux varus, although only two needed surgical intervention. In nine feet, transfer metatarsalgia was observed (4.8%).

Also, **Smith et al [15]** who carried out the internal fixation surgery (screws with plates), which still has six cases of comparable difficulties.

After a hallux valgus (HV) repair, complications were predicted to occur between 10% and 55% of cases. Avascular necrosis, arthritis, hardware removal, nerve injury, under correction/recurrence, overcorrection (hallux varus), transfer metatarsalgia, nonunion, malunion, and patient discontent are among the more often reported consequences. If the first metatarso-phalangeal joint is healthy, osteotomies will be the preferred operation; otherwise, the diagnosis of arthritis will support the fusion procedure. Complex cases of unsuccessful HV surgery are best handled after gaining extensive experience in primary HV surgery.

Wagner et al [13] concluded that the POSCOW osteotomy was a trustworthy and efficient way to reduce pain and enhance function.

Kannegieter Kilmartin [8] who stated that only one surgical side effect was noted, a wound infection that was treated with oral antibiotics for a week. Out of the five cases examined, one patient was entirely content with the outcome of their revision surgery. No patient expressed dissatisfaction with the outcome of their surgery, and four were satisfied with their concerns. After their surgeries, all five individuals said they were in a better place.

Senaris-Rodriguez et al. [16] using closing–wedge osteotomy of the proximal metatarsal in ten cases, reported two poor results due to post-op hallux varus deformity and nine cases of post-op metatarsal shortening, however without transient metatarsalgia. The relation between metatarsal shortening and transient metatarsalgia is still a matter of debate. Stabilization of the osteotomy with two K-wires was satisfactory and damage to the physis was not recorded.

This study had some limitations: small sample size and short follow-up period. Advantage: to reduce pain and restore normal toe and foot joint range of motion and muscle length.

CONCLUSIONS:

The two osteotomy techniques appear to be more clinically beneficial in treating hallux valgus deformity. Following surgery, there was a decrease in the radiological assessments of HVA and IMA, which is noteworthy for two surgical procedures. For the two types of osteotomies, there is a notable rise in the mean AOFAS score during the postoperative phase. According to the aforementioned information, there are no appreciable distinctions between the two surgical methods' outcomes.

We recommend studies with larger sample size are needed to confirm the current results. Further studies with longer follow-up are needed to evaluate the early results (clinical and radiological) surgical treatment of dome osteotomy versus medial opening wedge osteotomy in hallux valgus deformity. that future studies be conducted using well-designed randomized controlled trials or large, comparative observational studies.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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