



# Short Term Result Of Open Wedge High Tibial Osteotomy In Middle Age Knee Osteoarthritis Population

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**Abstract:** Osteoarthritis is a musculoskeletal disorders that were much greater than previously thought and accounted for 6.8% the most common cause of disability in older adults. This study is a retrospective analytic observational study with a cross sectional approach to postoperative high tibial osteotomy (HTO) patients at Dr. Soetomo general hospital and Husada Utama hospital in Surabaya. Based on the Femoro-Tibial Angle (FTA), most patients were varus 4 and valgus 6. In addition, there were a significant difference between the mean FTA angle and between VAS average before and after surgery ( $p < 0.001$ ) and ( $p < 0.001$ ). There is improvement in terms of clinical, radiological, and patient's satisfactory using the KOOS score.

**Keywords:** Osteoarthritis Genu, High Tibial Osteotomy

## I. INTRODUCTION

Osteoarthritis is the absolute most common reason for disability in more seasoned grown-ups. An investigation of the worldwide weight of disease detailed that musculoskeletal problems were a lot more prominent than recently suspected and represented 6.8% of the elements adding to diminished age non-productivity in patients (inability changed life year (DALY)) around the world. It is assessed that 10% to 15% of all adults beyond 60 years old have OA with differing levels of OA, with a higher pervasiveness among women than men. As indicated by the Unified Countries, by 2050 individuals beyond 60 years old will make up over 20% of the total populace. Of the 20%, treatment is conservative[1].

The aftereffects of long haul HTO medical procedure will be acceptable, if the right tolerant choice, surgical strategy, unbending fixation, and a decent postop convention have been done. In patients with segregated medial OA with varus disfigurement and free ROM without ligamentous instability, HTO medical procedure is recommended[2]. An open wedge HTO on the medial side mounted with a TomoFix plate gives strength identical to the wedge lateral closure technique[3,4,5] The 10-year survival rate for close to wedge osteotomy was accounted for to be 51% by Naudie et al and surprisingly up to 93.2% by Koshino et al. The positive result of the concentrate by Koshino was ascribed to a few postoperative variables including nonappearance of flexion contractures, anatomic valgus point of up to 10°, and attending patellofemoral decompression systems when demonstrated. As a general rule, HTO has a decent achievement rate in the initial ten years and disintegrates after 15 years[2]

This review will direct a few assessments with respect to genu osteoarthritis patients who went through high tibial osteotomy techniques. A few things that will be assessed are the clinical, functional and radiological conditions reflectively from high tibial osteotomy methods in postoperative patients to check whether high tibial osteotomy can meet patient assumptions. This concentrate likewise intends to decide the distinction between the postoperative femorotibial point (FTA) and 2 years postoperatively, the connection between the KOOS score and changes in the femorotibial point (FTA), and the connection between changes in the visual analogue scale (VAS) and changes in the femorotibial point (FTA).

## II. METHODS

This study is a retrospective analytic observational study with a cross sectional approach to postoperative high tibial osteotomy (HTO) patients. The review populace was patients who went through HTO medical procedure from 2014 – 2018 at Dr. Soetomo general clinic and Husada Utama emergency clinic in Surabaya. Patients who met the inclusive standards were gathered and data collection was obtained through clinical records from the Local General Clinic dr. Soetomo Surabaya and Husada Utama Emergency clinic Surabaya from 2014 - 2018. Visited patients, for assessment and meetings and finishing up polls from the KOOS score. Unmistakable information is shown as tables and charts. Information comprise of sexual orientation, age, BMI analyzed with respect to the consequences of the HTO medical procedure from clinical, specifically the level of torment (VAS), radiological assessment, in particular femorotibial point from x-beam genu, just as information assortment utilizing the KOOS score poll . This review had gotten Ethical Clearance Information No. 0227/LOE/301.4.2/XI/2020 gave by the Exploration Commission of the Dr. Soetomo Medical clinic Surabaya.

## III. RESULTS

In this study, data obtained were 24 patients who underwent high tibial osteotomy surgery at the Dr. Soetomo General Hospital Surabaya during the period 2014-2018. Of the total 29 patients, only 23 patients met the inclusion criteria and 6 other patients did not meet the inclusion criteria because they were not willing to be examined.

**Table 1** Distribution of patients who underwent high tibial osteotomy surgery

		N	Percentage (%)	Mean
Gender	Female	20	86,9	
	Male	3	13,1	
Age	< 40 years	0	0	
	41 – 50 years	8	34,8	
	51 – 60 years	12	52,1	
	>60 years	3	13,1	
	Total	23	100	
BMI	Normal	6	26,1	
	Overweight	6	26,1	
	Obesitas	11	47,8	
	Total	23	100.0	
KOOS Score	Pain			89,29
	Symptoms			92,51
	Activity daily living			93,61
	Sports			56,96
	Quality of life			82,61

In the total subjects of this study, as many as 23 research subjects. Based on gender, the most data were female patients with 20 patients (86.9%) compared to 3 patients (13.1%).

In this study, the majority of the age group was 51-60 years, namely 12 patients (52.1%). Meanwhile, at the age of 41-50 years there were 8 patients (34.8%). At the age of over 60 years there were 3 patients (13.1%).

The results of the descriptive analysis showed that the majority of BMI in patients undergoing high tibial osteotomy surgery were obese, namely 11 patients (61.1%). At normal weight there were 2 patients (11.1%) and in the overweight category there were 5 patients (27.8%).

The KOOS score consists of five components. The five components of all samples were averaged and obtained: the KOOS score for the pain component was 89.29; the KOOS score for the complaint component is 92.51; the daily activity component KOOS score is 93.61; the KOOS score for the sports and recreation component is 56.96; and the KOOS score for the quality of life component is 82.61.

**Table 2** Evaluation of the patient's femorotibial angle (FTA) on high tibial osteotomy (HTO)

Angle	Total patients
1. Before surgery	
Varus 2°	5
Varus 4°	10
Varus 6°	8
2. Post operation	
Valgus 4°	3
Valgus 6°	16
Valgus 8°	4
3. 2 years post operation	
Valgus 4°	3
Valgus 6°	16
Valgus 8°	4

**Table 3** Comparison of the femorotibial angle (FTA) in each group and wilcoxon test analysis

	Evaluation	N	Percentage	Mean	SD	Value p
FTA	Pre operation	23	100	175.83	1.47	0,000
	Post operation	23	100	186	1.2	
	Pre operation	23	100	186	1.2	0,100
	Post operation	23	100	186	1.2	

Comparison of the femorotibial angle (FTA) before surgery, postoperatively and 2 years postoperatively, an analytical test was performed using a paired T test with an alternative using the Wilcoxon test.

Meanwhile, the calculation of the distribution of the variable femorotibial angle (FTA) using the non-parametric Shapiro-Wilk test in Table 8 shows an abnormal distribution for the FTA angle ( $p < 0.05$ ) in the three preoperative, postoperative and 2 years postoperative periods. Therefore, a non-parametric Wilcoxon test was carried out to statistically analyze the differences from the point of view of FTA. Based on the Wilcoxon test analysis shown in Table 9, this study found a significant difference between the mean FTA angle before surgery and postoperatively ( $p=0.000$ ). This shows that the postoperative FTA angle outcomes in OA patients have a significant difference.

Meanwhile, based on the Wilcoxon test analysis shown in Table 10, this study found a non-significant difference between the mean postoperative FTA angle and 2 years postoperatively ( $p=0.100$ ). This shows that the difference between the postoperative FTA angle and 2 years postoperatively in OA patients is not significantly different.

**Table 4** The value of each KOOS score and delta angle FTA

	Score	N	Percentage	Mean	SD
Evaluation	KOOS Pain	23	100	89.29	7.84
	KOOS Symptoms	23	100	92.51	3.07
	KOOS Activity Daily Living	23	100	93.61	6.99
	KOOS Sports	23	100	56.96	17.17
	KOOS Quality of Life	23	100	82.61	14.5
	Delta FTA	23	100	10.17	1.59

Comparison of the changes in the femorotibial angle (FTA) before and after surgery (delta FTA) to the KOOS value, an analytical test was performed using the Pearson correlation test with the alternative using the Spearman correlation test.

Meanwhile, the calculation of the distribution of the KOOS score and delta FTA variables using the shapiro-wilk non-parametric test in Table 5.12 shows an abnormal distribution for the KOOS score and delta FTA ( $p < 0.05$ ). Therefore, Spearman's non-parametric correlation test was performed to analyze statistically.

**Table 5** Spearman correlation test between Delta FTA and KOOS Score

	Score	N	Percentage	Value p
Delta FTA	KOOS Pain	23	100	0,557
	KOOS Symptoms	23	100	0,699
	KOOS Activity Daily Living	23	100	0,194
	KOOS Sports	23	100	0,201
	KOOS Quality of Life	23	100	0,875

Based on the analysis of the Spearmann correlation test shown in Table 5.13, this study found an insignificant correlation between delta FTA and each KOOS score ( $p > 0.05$ ). This shows that there is a non-significant difference between the FTA angle delta and each KOOS score.

**Table 6** Comparison of VAS values in each group

	Evaluation	N	Percentage	Mean	SD
VAS	Pre operation	23	100	7.39	1.11
	Post operation	23	100	1.09	0.42

Comparison of the VAS values before and after surgery, an analytical test was performed using a paired T test with an alternative using the Wilcoxon test.

Meanwhile, the calculation of the distribution of the VAS value variable using the Shapiro-Wilk non-parametric test in Table 5.15 shows an abnormal distribution for the VAS value ( $p < 0.05$ ) before and after surgery. Therefore, a non-parametric Wilcoxon test was performed to statistically analyze the differences in the VAS values.

**Table 7** Wilcoxon test analysis od VAS value before and after surgery

	Evaluation	N	Percentage	Mean	SD	Value p
VAS	Pre operation	23	100	7.39	1.11	0,000
	Post operation	23	100	1.09	0.42	

Based on the Wilcoxon test analysis shown in Table 5.16, in this study, there was a significant difference between the mean VAS values before surgery and after surgery ( $p = 0.000$ ). This shows that the outcome of postoperative VAS values in OA patients has a significant difference.

**Table 8** Value of each delta VAS Score and delta FTA Angle

	Score	N	Percentage	Mean	SD
Evaluation	Delta VAS	23	100	6.3	1.29
	Delta FTA	23	100	10.17	1.59

Comparison of changes in the femorotibial angle (FTA) before and after surgery (delta FTA) to the value of VAS before and after surgery (delta VAS) an analytical test was performed using the Pearson correlation test with the alternative using the Spearman correlation test.

Meanwhile, the distribution calculation on the deltas VAS and FTA using the non-parametric Shapiro-Wilk test in Table 5.18 shows that the distribution is not normal for the delta VAS and deltas FTA ( $p < 0.05$ ). Therefore, Spearman's non-parametric correlation test was performed to analyze statistically.

**Table 9** Spearman correlation test between Delta FTA and Delta VAS

		N	Percentage	Value p
Delta FTA	Delta VAS	23	100	0,780

Based on the analysis of the Spearmann correlation test shown in Table 5.19, this study found an insignificant correlation between the delta FTA and the delta VAS ( $p > 0.05$ ). This shows that the correlation between the magnitude of the delta FTA angle and delta the VAS value is not significantly different.

#### IV. DISCUSSION

The results of this review supplies information that patients who went through HTO dependent on sex were generally female patients with 20 patients (86.9%) contrasted with 3 patients (13.1%). The outcomes as per past study, which expresses that of 1,418 research subjects with respect to OA, 831 of them are women [6]. This is as per a review led by Ganvir which expressed that epidemiologically, knee OA patients were more normal in women than in men in the US and Egypt. This is identified with diminished degrees of estrogen and progestin at menopause age which is a danger factor for OA [7]. At menopause there is estrogen inadequacy which plays a part in foundational inclination to OA [8]. Hormonal variables can impact the movement and development of the infection. Dissimilarity can likewise be identified with contrasts in bone and tendon design that cause changes in arrangement, laxity, or diminished cartilage volume in women contrasted with men [9].

In this review, it was discovered that most of the age group who went through HTO were 51-60 years, specifically 12 patients (52.1%) in view of the gathered information. This is upheld by past research which expresses that greater age builds the commonness of OA [6]. The extent of patients with knee OA increments with age in the populace in all kinds of people. The expanding pervasiveness and frequency of OA in more established individuals is believed to be the aftereffect of the amassing of openness to different danger factors and biological changes that happen in the aging process, for example, cartilage thinning, diminished muscle strength, diminished proprioception and oxidative harm [10].

The genuine connection among age and prevalence of OA isn't clear. There are a few speculations proposing that adjustments of ordinary joint structure, the quantity of chondrocytes and the extracellular matrix can diminish the limit of the joint to adjust to chemical and mechanical aggravations. Chondrocytes have a breaking point to the quantity of replications all through life (around 30-40 divisions) called "hayflick limit". This wonder will be the last premise of the cell cycle movement. The aging process can cause a huge abatement in the quantity of articular cartilage chondrocytes and will go through apoptosis which is straightforwardly connected with the level of cartilage damage. The chondroprotective agent of the articular ligament is addressed by a mucinous glycoprotein item (PRGP 4) gene named ointment or superficial zone protein (SZP). Lubricants play a part in deciding the beginning and movement of the disease. This glycoprotein plays a part in cartilage tissue, for example, lubrication of the cartilage surface, counteraction of cartilage wear and synovial cell bond. Information from different investigations show that recombinant lubricants controlled to creature models of OA have displayed to ensure ligament and forestall infection movement [9].

Most of BMI in patients going through high tibial osteotomy medical procedure were obese, in particular 11 patients (47.8%). Obesity will build the mechanical burden on the body and will likewise lessen the degree of muscle tone which causes more prominent joint work. Fat cells will likewise discharge cytokines that corrupt the network in the joints which will later reason OA [11]. In individuals who are obese it will be simpler to get in shape, as per Rodriguez, however much 5 kg will decrease the danger of OA by half. Weight reduction can likewise decrease pain and disability in individuals with OA [11].

Knee injury and osteoarthritis result score (KOOS) is one of the appraisals that is regularly done to assess treatment in knee OA. There are five manifestation subscales identified with knee, pain, exercise and recreation, activity of daily living (ADL), and quality of life (QOL). The KOOS score comprises of five parts [12]. In this review, in patients who had HTO the five parts of all examples determined the KOOS score and acquired: the KOOS score for the pain component was 89.29; the KOOS score for the complaint part is 92.51; the ADL KOOS score is 93.61; the KOOS score for the sports and recreation is 56.96; and the KOOS score for the quality of life component is 82.61. On each subscale, 100 points equivalents to no problem, while 0 point rises to extreme issue. An expansion of 10 focuses in the subscale was considered clinically significant. As indicated by Collins who directed a comparative study on various scoring systems, the KOOS score was considered to meet the standards to be utilized as an evaluation device for both clinical and research purposes [13].

The reason for performing HTO is to move the mechanical axis from the medial to somewhat lateral from the knee midline to decrease the knee load that can postpone the event of osteoarthritis (OA). Hence, it is important to assess the FTA to see the accomplishment of the HTO operation. Notwithstanding, the objective of OA treatment is to diminish the complaints of these patients. In this study, the KOOS score was used to evaluate OA complaints of post-HTO patients. Thus, the researchers compared the number of angles that changed with the KOOS score in patients undergoing HTO. In this study, no significant results were



obtained. This is in accordance with research conducted by Nakajima, which shows that the value of the FTA angle has no effect on the KOOS value in general [14].

In this review, the VAS scores on preoperative and postoperative outcomes were significant. This is, as per research directed by Kim which showed the aftereffects of VAS values before a medical procedure and postoperatively acquired significant outcomes [15]. In a review directed by Bode additionally showed the same thing, it was tracked down that the VAS esteem diminished in patients who got HTO treatment for preoperative and postoperative. This shows that the objective of HTO is accomplished to decrease pain complaints based on scores (Bode et al., 2015). In this way, the specialist thought about the difference between the preoperative and postoperative FTA points based on the VAS values to show the relationship of the FTA points with the VAS values. In this review, the outcomes were not huge. In Kim's review, there was no huge change in VAS dependent on the distinction between the preoperative and postoperative FTA angles [15]. Pain is the main complaint felt by patients with OA. OA treatment itself expects to decrease pain in patients with the goal that they can perform day by day exercises ideally [11]. In this review, it was tracked down that postoperative HTO experienced huge agony. Be that as it may, there is no critical relationship between the quantity of FTA points and the VAS number, so further examination is required in such manner.

There are a few limitations, the first is the brief distance between the assessment time frame. Second, the quantity of tests is little. The idea in this review is that the follow-up evaluation distance can be divided can be separated into medium and long in order to portray the impact of HTO medical procedure, particularly in the long haul. The second suggestion is that the study should have a larger sample size to better describe the effect of HTO on a larger sample.

## V. CONCLUSION

Patients with osteoarthritis (OA) genu post high tibial osteotomy (HTO) obtained improvements in clinical terms based on the VAS score, and radiologically based on the femorotibial angle (FTA), and the evaluation value of the KOOS score was satisfactory. However, there was no significant change in the evaluation of the femorotibial angle (FTA), the change in the FTA angle on the KOOS score, and the change in the FTA angle on the VAS value. For future research, it is possible to conduct further studies with a larger number of samples and a longer time, so that the survival rate of high tibial osteotomy (HTO) in patients with osteoarthritis (OA) genu can be determined.

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