

Medial opening wedge high tibial osteotomy with the navigated iBalance HTO system and early weight bearing: A Evaluation of precision and maintenance of correction after 1 year

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Abstract

Safety and stability of the Arthrex iBalance HTO system has been demonstrated using standard surgical techniques and conventional postoperative rehabilitation protocols. The purpose of the current study was to investigate the accuracy and stability of the osteotomy following iBalance implantation using a minimally-invasive, navigated surgical technique, in combination with an accelerated rehabilitation protocol.

A prospective, observational study of 20 consecutive patients undergoing medial opening HTO with the iBalance implant and a minimallyinvasive, computer-navigated surgical technique was conducted. Intraoperative stressed hip-kneeankle (HKA) angles measured with navigation were compared to 2 weeks postoperative HKA angles measured on long leg radiographs to determine the accuracy of the surgical technique.

Keywords: Arthrex, HTO, HKA.

Accepted on October 15, 2021

Introduction

The maintenance of correction was assessed to 1 year postoperative. Time to union and full weight bearing and pre- and postoperative patient-reported outcome measures (PROM) were also evaluated.

All knees were corrected to valgus, with the target correction of 2o to 3o valgus achieved for 63.2% of patients. No significant differences were observed between mean intraoperative stressed HKA and mean postoperative HKA angles. The lateral cortical breach occurred in one patient postoperatively; however, no additional complications arose throughout the study period. PROM demonstrated a significant reduction in pain scores and increased mobility between 6 weeks to 3 months postoperative. The mean deviation of correction was $1.4^{\circ} \pm 1.7^{\circ}$ at 1-year post-surgery. Intraoperative use of computer navigation was able to accurately reproduce preplanned correction angles, with the maintenance of tibial correction over 1 year using the iBalance in combination with an accelerated rehabilitation program. The tibiofemoral (TF) and patellofemoral (PF) joints make up the knee joint, which is a very complex and crucial joint for load and mobility.

The interaction of ligamentous and cartilaginous tissues, the meniscus, as well as various muscles and tendons, is crucial to the stability of the knee joint. During daily activities, the tibiofemoral joint is subjected to loads that are several times the body weight (BW). Stair descending had the highest average peak resultant forces (346 percent BW), followed by stair ascending (316 percent BW) and level walking (261 percent BW).

The distribution of medial-lateral force is affected by tibiofemoral alignment and varies depending on the weight-bearing task. The medial-lateral weight distribution on the tibia changes during walking. Furthermore, nearly 75% of the joint load Osteoarthritis (OA) is the most common joint condition in adults around the world today. The progressive loss of articular cartilage is accompanied by new bone growth and, in certain cases, synovial proliferation, which can result in discomfort, loss of joint function, and disability. Radiographic evidence, as well as persistent joint pain or stiffness, describe symptomatic OA. Articular cartilage degeneration, primarily in the medial compartment, is the most frequent pattern of symptomatic OA in the knee. With increasing load transmission via the already degenerate compartment, joint degeneration causes a varus deformity. In addition, during walking, knee joint loads and kinematics were shown to be changed in patients with early knee OA. From January 2008 through December 2018, a literature search was undertaken utilising electronic databases, including PubMed, for English-language studies with full text. When the search term "high tibial osteotomy" with full text for humans was used in the PubMed database, 777 papers were found. The majority of them were designed to look at the functional clinical result after surgeries and assess the factors that influenced it. Biomechanics analyses of HTO are required. As a result, these were omitted, as were research on patella and ligament restoration. Following the screening, 76 related literature studies were found. Then there were seven papers about comparative research between HTO and UKA or TKA. The 13 highly referenced papers from ten years ago performed the same thing.

After HTO, the patient's gait pattern is altered based on limb alignment, which influences the knee adduction moment and medial-lateral contact forces, as well as the cartilage contact stresses in the medial and lateral compartments of the tibiofemoral joint. Understanding the difficulties of HTO and enhancing surgical precision require a thorough understanding of the biomechanical environment. However, biomechanical research on HTO in terms of gait analysis, joint kinematics, and joint contact mechanics is still lacking. The biomechanical links between plate fracture, cartilage degeneration, nonunion, and other complications are still unknown..

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