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ORIGINAL PAPER

Evolution of open-wedge high-tibial osteotomy: experience with a special angular stable device for internal fixation without interposition material

Alex E. Staubli · Hilaire A. C. Jacob

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Abstract Surgical correction of bowed legs should be performed as early as possible. Overload osteoarthritis, even without significant varus deformity of the knee, is a further indication for open-wedge high-tibial osteotomy. Progression of damage to the joint surfaces due to overloading can be significantly retarded by realigning the extremity with the aim to, at least, reduce overload on the medial compartment to a value close to physiological. Significant improvement to open-wedge high-tibial osteotomy (OWHTO) has been made on two fronts: (a) by the use of a more appropriate surgical technique and (b) by promoting osteogenesis through an angular-stable fixation device with just the correct amount of elasticity. A retrospective study of 53 consecutive cases in which no interposition material was used to fill the wedge, with gap openings between 5 mm and 20 mm, showed that ossification of the gap always progressed from the lateral hinge towards the medial side. Standard radiographs showed 75% of the gap filled in with new bone within 6 −18 months. In conclusion, we believe that open-wedge high-tibial osteotomy using the TomoFix® plate has proved to be successful in treating unicompartmental gonarthrosis, even without bone grafts or bone-substitute material.

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Introduction

Pain and difficulties in ambulation encountered by individuals with bowed legs and knocking knees have been well known and reported for centuries. However, these disorders were only clearly defined by Mikulicz-Radecki who in 1880 first observed that in most "normal" individuals, a straight line could be drawn in the frontal plane, with the knee extended, through the centres of three joints: the hip, the knee and the ankle. He then defined genu varum, or genu valgum, as the condition when the centre of the knee joint appreciably deviated from the line connecting the other two centres. Mikulicz himself termed this the "Direktionslinie", or direction line [7].

Biomechanical reflections early in the twentieth century already indicated that a varus knee would load the medial compartment excessively, whereas a valgus knee would expose the lateral compartment to overload, and Mikulicz's line began to be referred to as the load-carrying line or the mechanical axis [7]. Whereas the concept of such terminology might be acceptable when the patient is standing on both legs, it does not apply to one-legged stance—a common situation in human walking—where the line of gravity passes medial to the whole knee. Total tibiofemoral forces (that include stabilising muscle forces) have been estimated to amount to well over twice the body weight in normal walking, and in some activities, such as walking down stairs, forces might even be close to five times the body weight. Furthermore, the greater part of this force is transmitted through the medial compartment of the joint [12, 13, 16]. Cartilaginous degeneration is also more commonly encountered in the medial compartment. Subsequent osteoarthritic deformation of the region results in marked varisation, which further increases the distance between the line of gravity and the joint, calling for still

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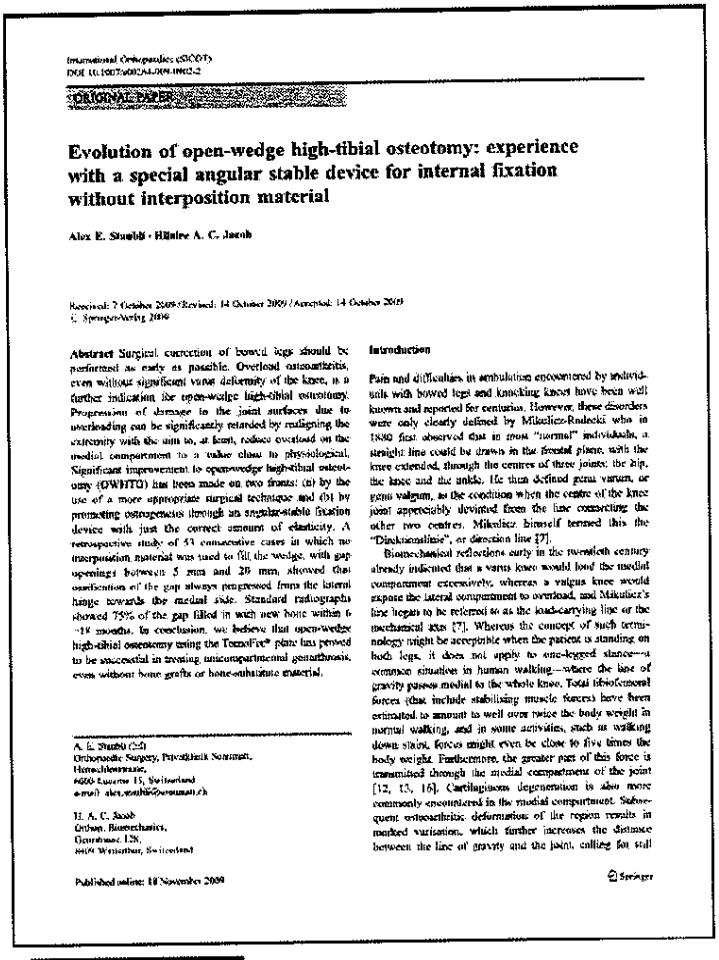

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