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A COMPARATIVE MATCH-PAIR ANALYSIS USING ADIPOSE-DERIVED MESENCHYMAL STEM CELLS PLUS BIPLANAR TIBIAL OPEN-WEDGE OSTEOTOMY IN TREATMENT OF VARUS KNEE OSTEOARTHRITIS

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Disclosures:

None of the authors received payments or services, either directly or indirectly (i.e., via his or her institution), from a third party in support of any aspect of this work.

None of the authors, or their institution(s), have had any financial relationship, in the six-twelve months prior to submission of this work, with any entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work.

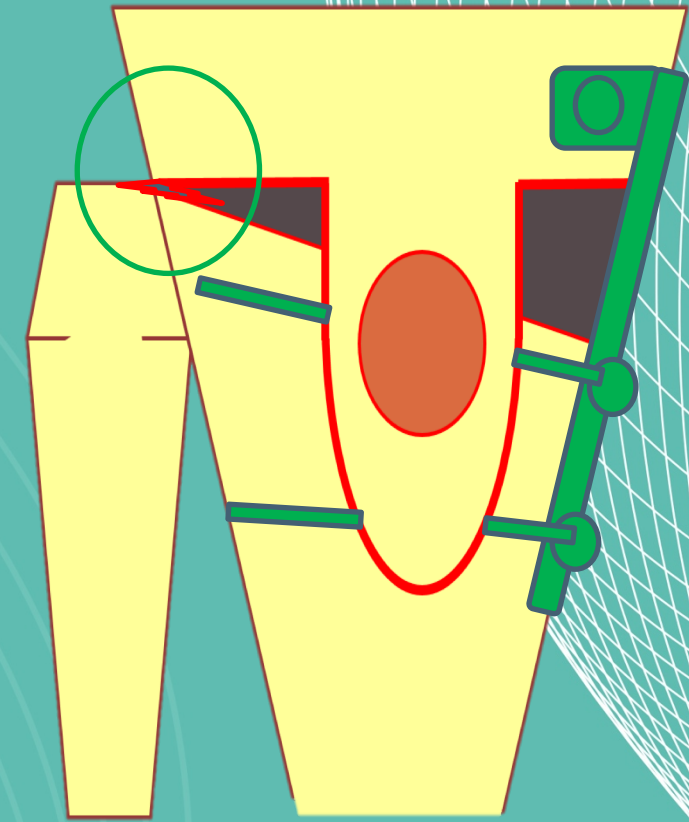
Baldassarri Matteo M.D. is a consultant for Tulip Medical Products (San Diego, CA). The other authors have never had other relationships, or has engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work.



INTRODUCTION

High tibial osteotomy (HTO) is reported to be an effective treatment for varus knee osteoarthritis (OA) by redistributing the load line within the knee joint. Otherwise cell-based tissue engineering approach using autologous adipose mesenchymal stem cells (AASCs) has addressed the issue of articular cartilage repair in knee OA.

This report aims to show the clinical and radiological results of a new HTO technique incorporating the tibial tubercle into osteotomy line (TT-OWHTO) associated with AASC application.



MATERIALS AND METHODS

Seventy-four patients were treated with TT-OWHTO for varus knee OA from September 2018 to April 2020; patients treated with TT-OWHTO alone (*conventional group*; n = 37) were pair-matched with those who underwent TT-OWHTO with an AASCs injection (*injection group*; n = 37) based on sex, age, and lesion size. Clinical outcomes were evaluated using the International Knee Documentation Committee (IKDC) score and Lysholm score. At each follow-up a radiological control was performed both to verify the state of bone healing in the osteotomy lines and to check the correct maintenance of the axis.



SURGICAL TECHNIQUE

FIRST SURGICAL STAGE: HIGH TIBIAL OSTEOTOMY

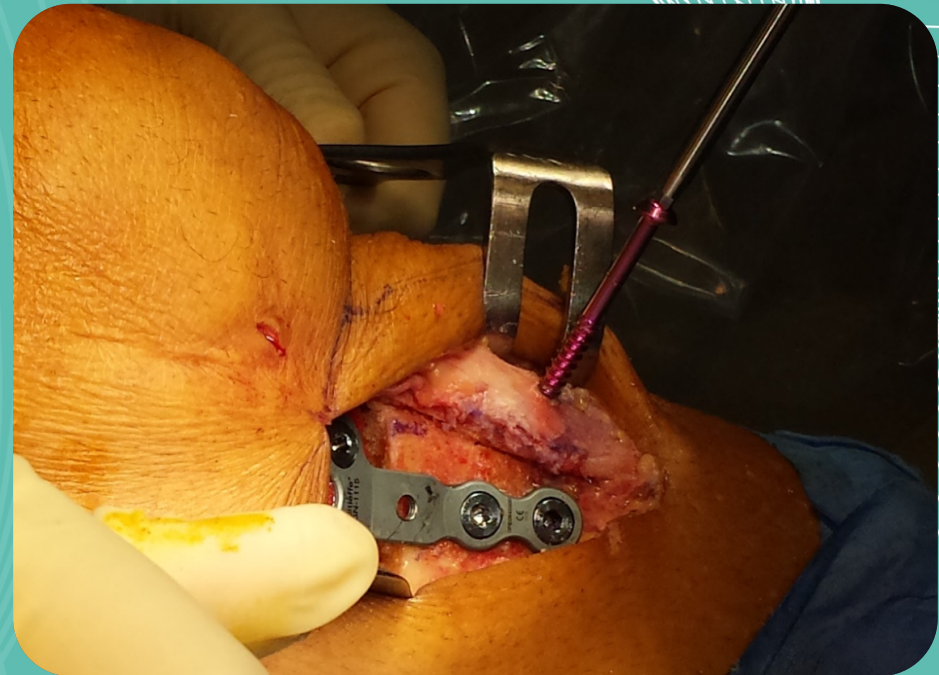
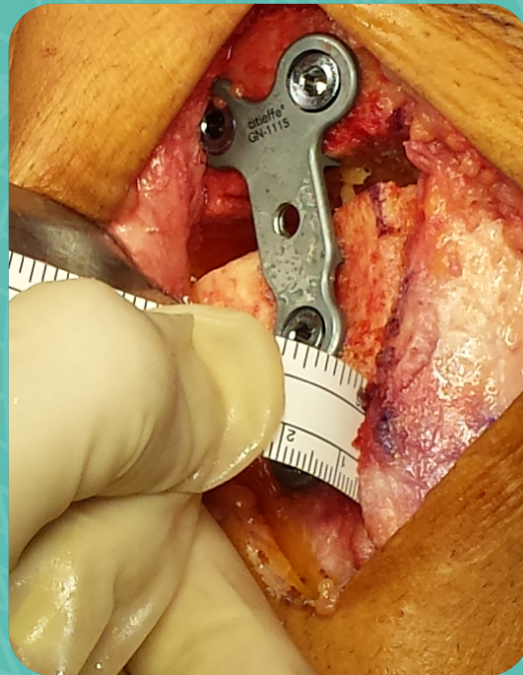
After an arthroscopic look to treat any intra-articular lesions a proximal antero-medial tibial approach extended to 7–9 cm is used. The tissue is dissected to the level of the sartorius fascia, the periosteum is carefully detached, until palpating the fibula head.

Under fluoroscopic guidance, with the knee extended, 2 parallel K-wires are positioned as a guide for the tibial cut. The anterior wire touches the apex of the fibula, while the second overlaps the image of the first. The cutting is then carried out with an oscillating saw, guided by the 2 wires, stopping at 10 mm from the lateral cortex and 10 mm from the anterior cortex.

After the exposure of tibial tuberosity, with a micro-saw, the cutting is performed on the anterior plane 20 mm wide, 10 mm thick at the metaphysis which distalizes in a wedge for 30–40 mm, so as to isolate the tuberosity-epiphyseal complex from the metaphyseal segment. The tibial osteotomy is progressively supplied with osteotomes so as not to interrupt the lateral cortex.

With a graduated wedge, the opening of the metaphysis is obtained, according to the planning, while the tuberosity remains independent with respect to the metaphyseal–diaphyseal tibial segment.

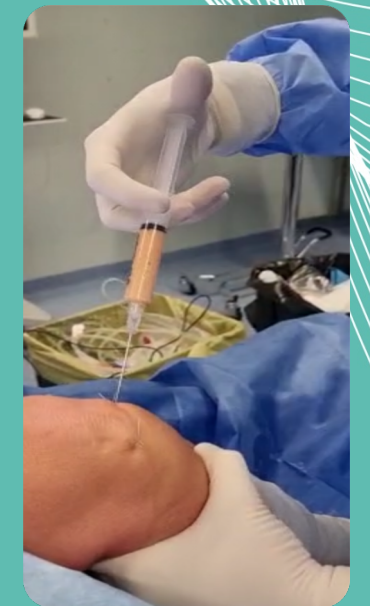
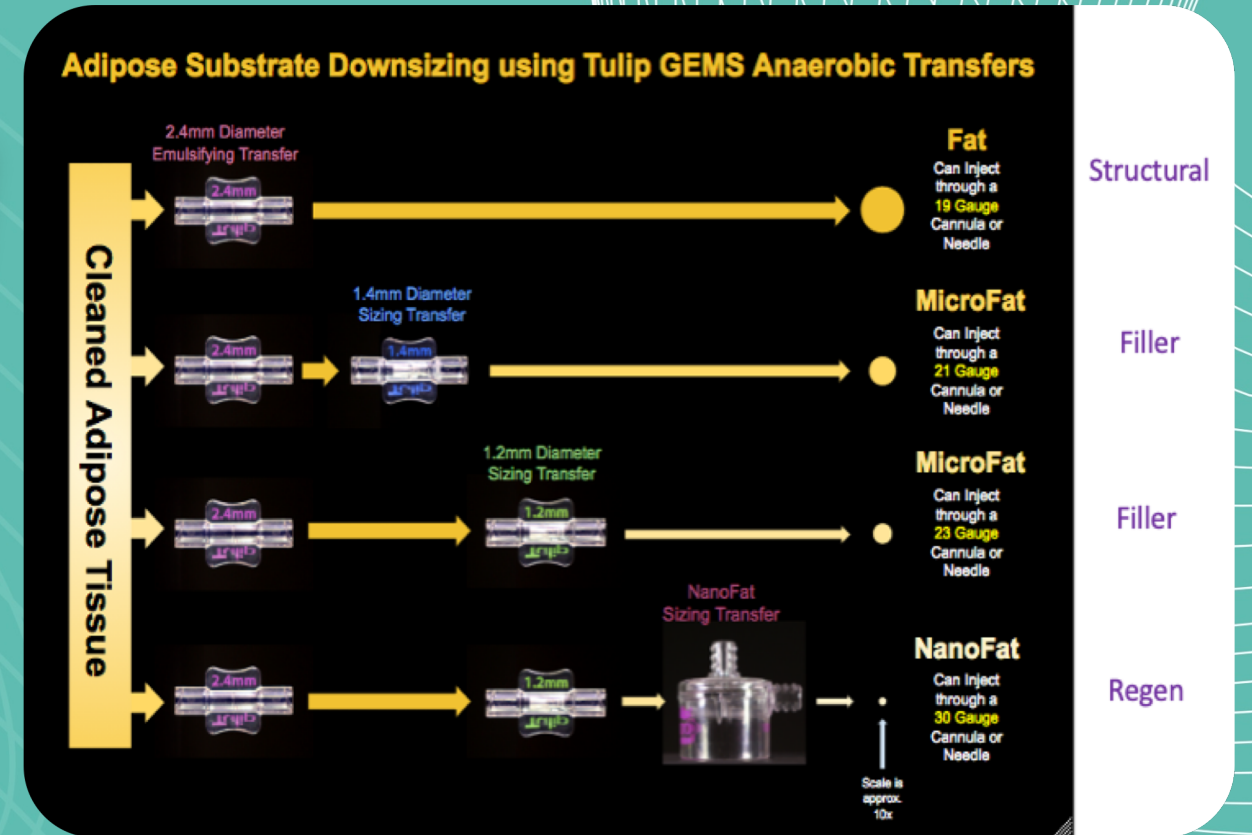
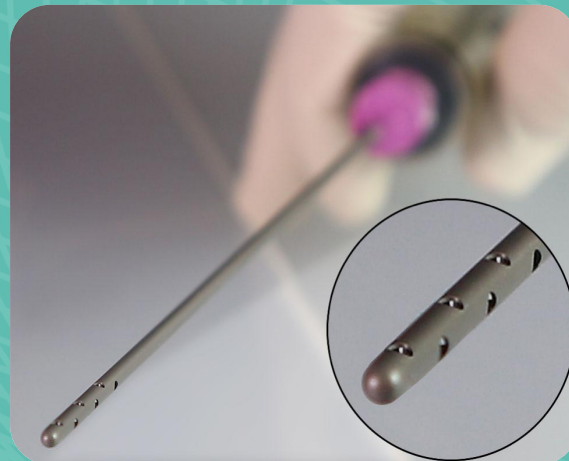
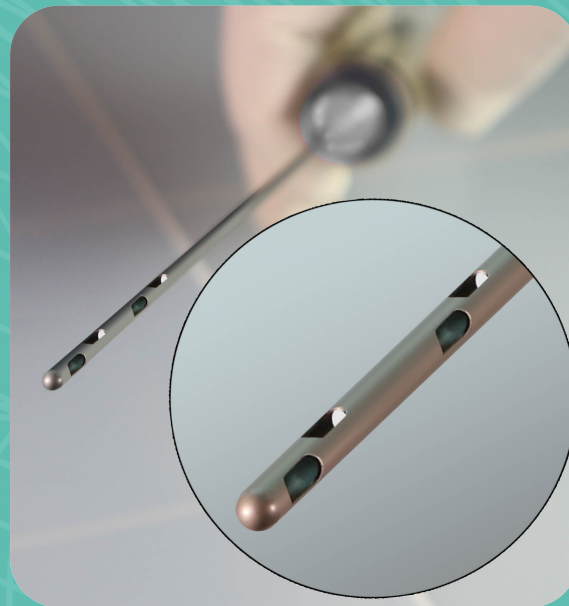
Osteosynthesis is performed with plate and titanium screws and the tuberosity is stabilized with a screw.



SURGICAL TECHNIQUE

SECOND SURGICAL STAGE: AUTOLOGOUS ADIPOSE MESENCHYMAL STEM CELLS

A high-negative-pressure liposuction procedure was performed using a standard liposuction device. Fat was harvested from the lower abdomen after infiltration with a modified Klein solution (lidocaine 800 mg/liter and adrenaline 1:1,000,000). The harvested fat was filtered through a multi-port 3-mm cannula with sharp side holes of 1 mm in diameter. Lipoaspirate was mechanically emulsified after rinsing. Emulsification of the fat was achieved by shifting the fat between two 10-cc syringes connected to each other by a female-to-female Luer-Lok connector. After 30 passes, the fat changed into an emulsion obtaining the final NANOFAT product which is injected inside the knee.

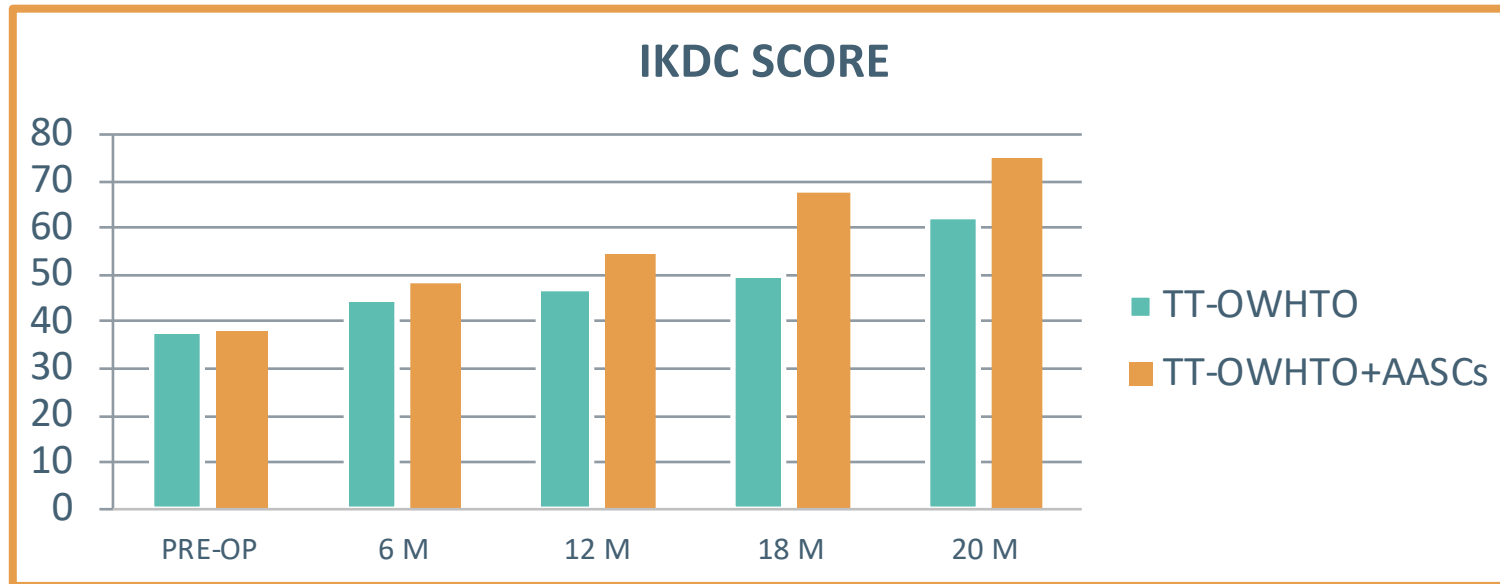


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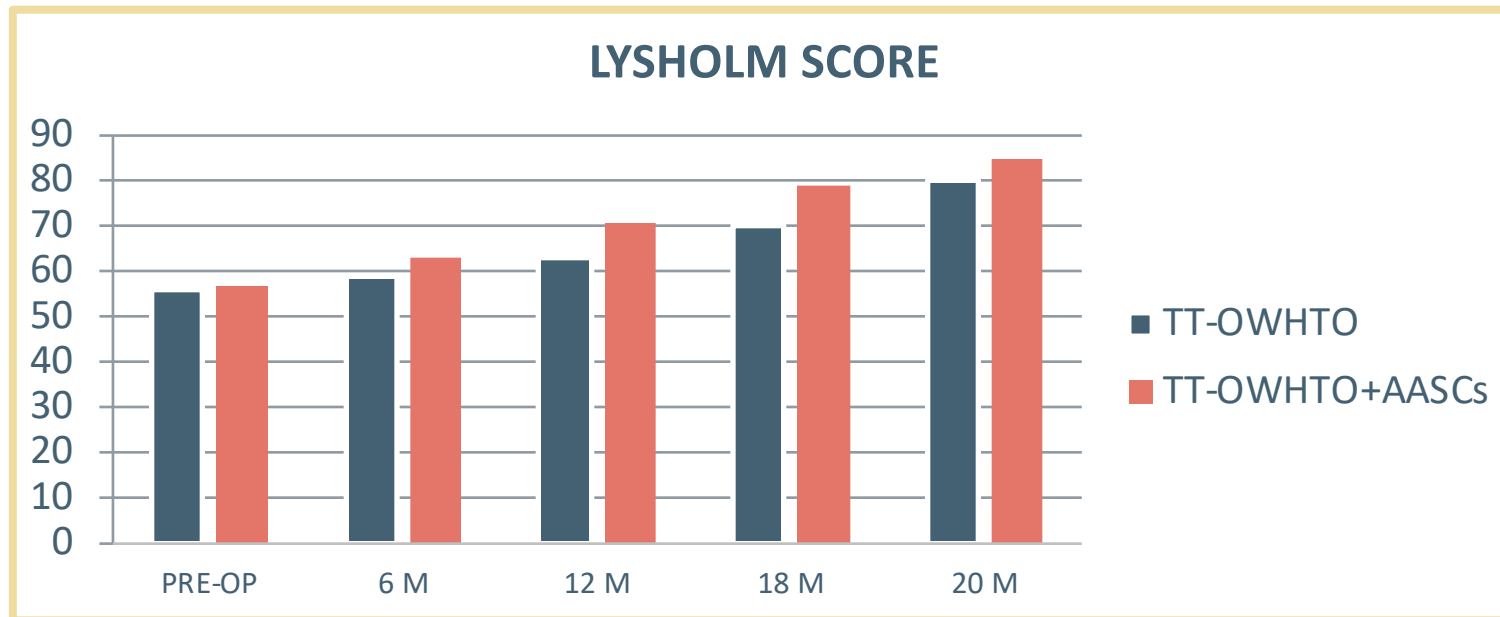
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RESULTS



Clinical outcomes at final follow-up improved for **conventional group** from 38.2±3.5 to 62.3±9.1 (IKDC) and Lysholm from 56.3±11.2 to 80.2±8.3.

On the other hand for **injection group** IKDC improved from 38.4±9.2 to 74.8±13.4 and Lysholm from 56.7±12.2 to 84.7±8.9 (P<0.001 and P= 0.034, respectively).

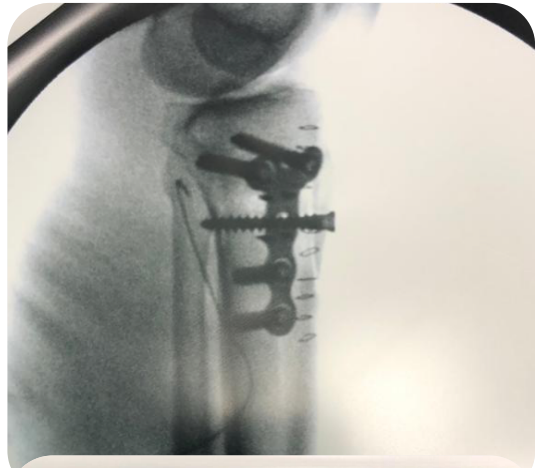
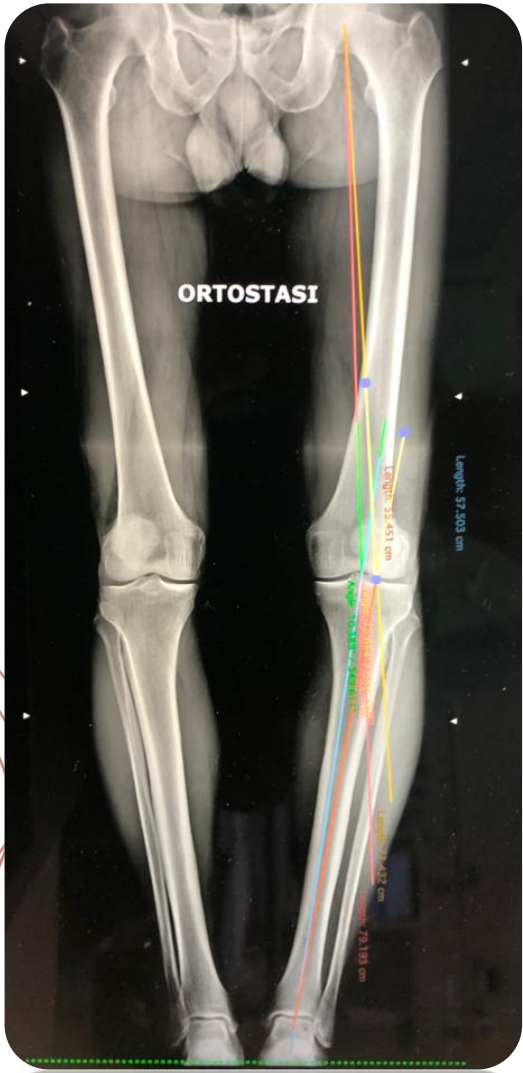


At final follow-up, there was a significant difference in the mean IKDC and Lysholm scores between groups (P=0.049 and P=0.041, respectively).

Overall Radiological outcomes at final follow-up showed improved knee joint alignment relative to patients' preoperative conditions.

CLINICAL CASE (Male - 46 ys)

PRE-OP



INTRA-OP



FU 20 M

CONCLUSIONS

TT-OWHTO is a safe and feasible procedure which in expert hands guarantees optimal results for the patient who still desires sporting ambitions.

The AASCs booster provides concrete support which results in higher clinical scores in each follow-up.



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