

Orthosphere® Zirconia Ceramic Implant for Arthroplasty in Fifth Tarso-Metatarsal Joint Arthritis of the Foot: A Case Presentation

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A case describing the use of the Orthosphere® Zirconia Ceramic Implant (Wright Medical Technology, Arlington, TN) is presented. The tarso-metatarsal joints in the foot are common sites for degenerative arthritis and pain secondary to trauma and biomechanical abnormalities. Often, conservative treatment is unsuccessful in relieving symptoms, and surgical intervention is required. The clinical presentation and surgical indications for use of the implant is described. A case is presented describing the indications and surgical technique. This implant has practical and promising implications for use in tarsal-metatarsal joint arthritis.

Mid-foot osteoarthritis and post-traumatic arthritis are common in the foot, specifically at the Lis Franc joint complex. Good results have been obtained with first, second, and third tarso-metatarsal joint (TMTJ) arthrodesis using screws, plates, pins and other methods of fixation.^{9,13} Little has been described on the fusion of the fourth and fifth TMTJ's (lateral column). Fusion of the fifth TMTJ poses a unique problem in regards to its independent tri-plane range of motion (inversion-eversion, plantarflexion-dorsiflexion, and abduction-adduction) which is necessary for proper foot biomechanics.^{9,11,13}

Joint arthroplasty using the Orthosphere® Zirconia Ceramic implant (Wright Medical Technology, Arlington, TN) was developed for osteoarthritis and post-traumatic arthritis of the carpo-metacarpal joints in the hand.^{1,4,6,7,12}

We present a case in which the Orthosphere® implant was successfully used in an arthroplasty of an arthritic fifth TMTJ, preserving its tri-plane range of motion.

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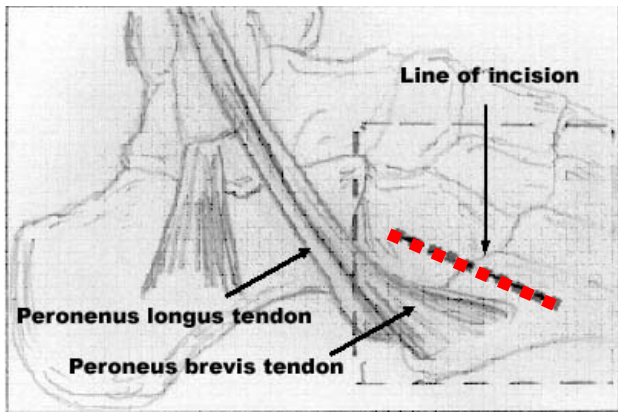


Figure 1 A 3-4 cm dorsolateral incision is made over the fifth TMTJ. Caution should be exercised to not damage the peroneus tendon insertion.

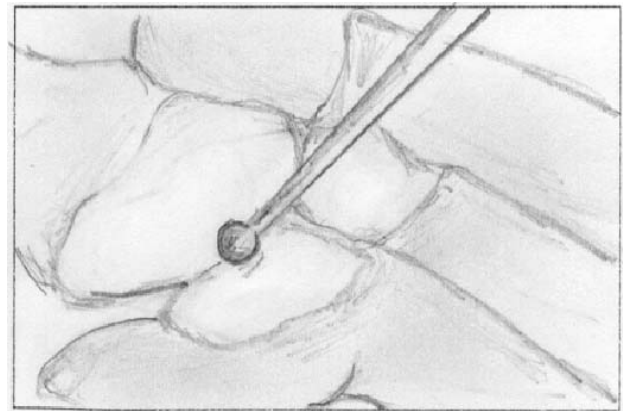


Figure 4 Once the joint is prepared, a rotary burr is used to create the recess for the implant.

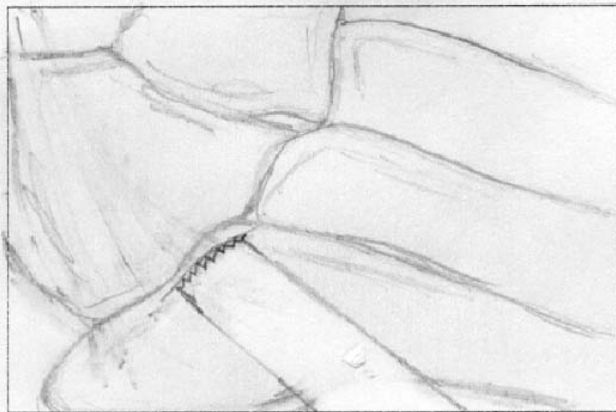


Figure 2 The fifth TMTJ is resected with the oscillating saw. The saw is used in preparing the recess.

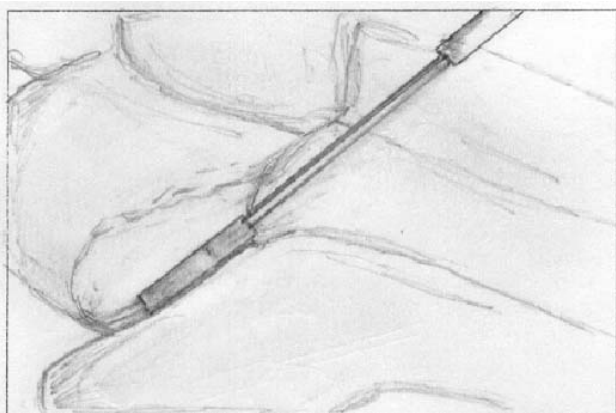


Figure 3 An implant sizer is used to determine the probable size of the implant.

Surgical Technique

The Orthosphere® Instrument Set includes 6 oscillating burrs, 6 implant sizes, 2 rotary starter burrs, insertion forceps, burr cleaning brush, and power adapters. This instrument set is easily adapted for application in foot surgery.

A 4 cm dorsolateral incision is made over the fifth tarso-metatarsal joint (TMTJ) for isolated lateral column fusion or between the fourth and fifth TMTJ's when both joints are to be replaced. Once the capsule is reached, it is incised. The peroneus brevis tendon insertion is preserved throughout dissection. (Fig. 1)

The joint is adequately resected and irrigated free of debris to allow complete visualization of the metatarsal base and cuboid articulation. (Fig 2) An implant sizer is then inserted into the metatarsal cuboid gap to determine a probable implant size. (Fig. 3)

A supplied rotary burr (3-5 mm diameter) is used to create a centralized partial recess on the articulating surface of 5th TMTJ. (Fig. 4)

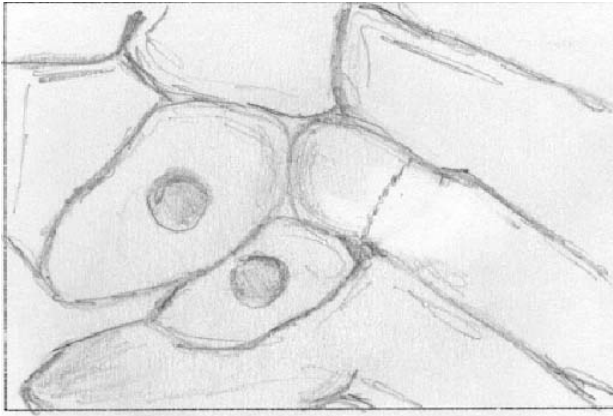


Figure 5 The recess is enlarged to incorporate various sizes.

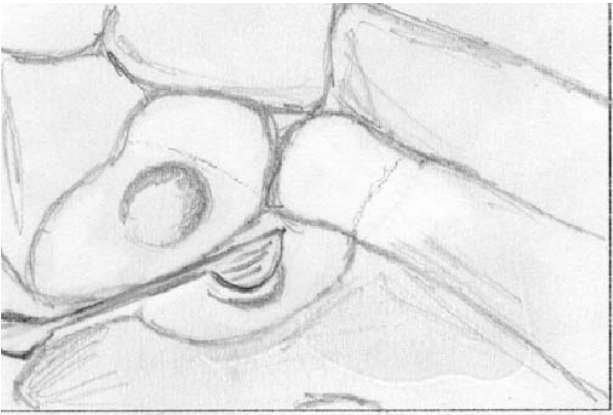
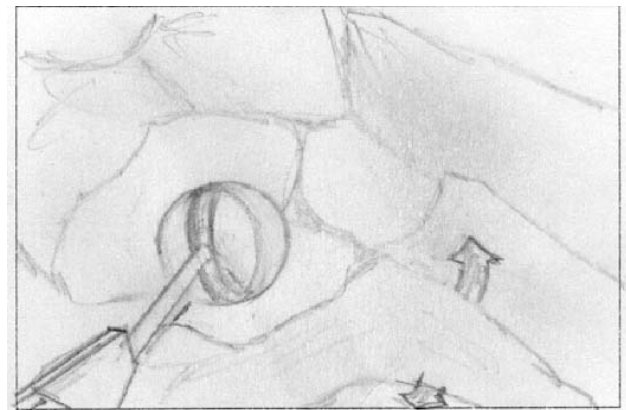
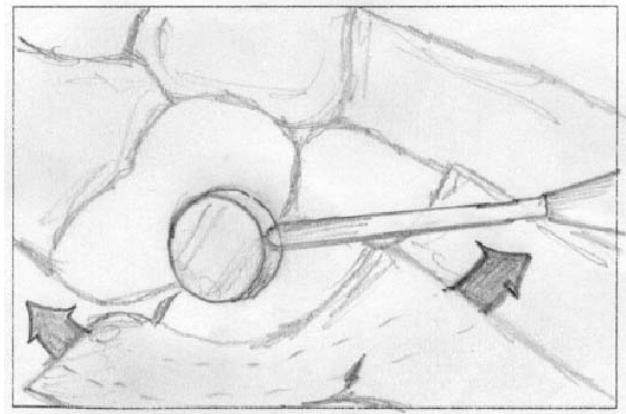


Figure 6 The oscillating burr should be completely seated in the TMTJ to ensure the stability of implant.



Figures 7-8 Appropriated recesses are obtained when the trial sizer permits adequate range of motion on the fifth TMTJ: dorsiflexion/plantarflexion, inversion/eversion, abduction/adduction.

The recess is then enlarged to approximately 7-8 mm in diameter and 3mm in depth using the oscillating semispherical burr. (Fig. 5-6) Once completed, the sizer for the desired implant is placed into the spherical recess space. (Fig 7)

If the sizer cannot be rotated into position, then deeper seating will be required. It is important to ensure that the cuboid depth is at least 1/3 the diameter of the spherical portion of the sizer before reburring. Appropriate recesses are obtained when the trial sizer permits adequate dorsiflexion-plantarflexion of the 4th TMTJ, and triplane motion of the 5th TMTJ. (Fig. 8)

The sizer is removed and the implant is placed with firm steady pressure to seat the implant into the prepared recess. (Fig. 9)

The implant positioning and seating is verified by direct visualization and with intra-operative multi-planar fluoroscopy. The TMTJ motion is again evaluated. The wound is then irrigated. The capsule is re-approximated with 4-0 absorbable suture, and the surgical site is re-approximated in layers. The patient is non-weight bearing using crutches or walker for two to three weeks and then gradual return to full weight bearing over a two to four weeks period in post-operative shoe.

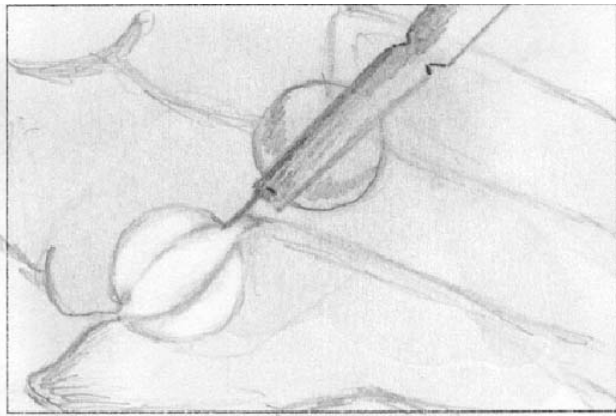


Figure 9 Placement of sphere implant with the inserter.

Unrestricted activity is encouraged after four to six weeks.

Case Report

A 62 year-old woman presented with chronic pain at the fifth tarso-metatarsal joint (TMTJ). The patient stated she had pain while doing daily activities. The pain had been worsening for approximately 10 years and is now intolerable. The patient attributes her pain to an ankle sprain several years prior. Over a three year period, she has undergone treatment from a podiatrist and a foot and ankle orthopedist. She states that, “both went out of their way to make me comfortable but were ultimately unsuccessful.” Previous treatment consisted of oral anti-inflammatories, orthotics, and steroid injections at the fifth TMTJ. These treatment modalities provided only short-term relief.

Upon presentation to the senior author’s office, she had pinpoint pain and radiographic degenerative changes at the fifth TMTJ. (Fig. 10) She was given a diagnostic injection into the fifth TMTJ with 1% plain lidocaine and subsequently ambulated without discomfort in the office. Her orthotics were well fitted and held her rearfoot in a rectus position with a normal forefoot to rearfoot relationship.



Figure 10 Pre-operative radiograph.

Surgical intervention was discussed with the patient. The patient agreed with this plan of care, and she was scheduled for surgery.

An isolated fifth TMTJ arthroplasty with the Orthosphere® system as previously described was performed. (Figures 11,12) The patient was non weight bearing on crutches for two weeks, full weight bearing in a surgical shoe for two more weeks, and returned to normal shoe gear at one month after surgery.

Now, 6 months after joint arthroplasty, the patient is walking 2-3 miles daily for exercise. She is able to perform all of her normal daily activities without discomfort. She is able to wear all types of shoe gear and is without limitations.



Figure 11 Post-operative DP x-rays showing the Orthosphere® Zirconia Ceramic Implant in place.

Discussion

Anchovy arthroplasty of the fifth tarso-metatarsal joint has been performed for arthritic pain.¹⁴ This has inherent complications with sacrificing a portion of the peroneous brevis tendon, therefore losing some eversion strength and ankle stability.

In hand surgery, operative treatments for arthritic carpo-metacarpal and interphalangeal joints may include arthroplasty with replacement implants. These implants include the Swanson silicone®, Sutter prosthesis®, and Neuflex silicone® implants.^{7,8,9}



Figure 12 Lateral x-rays showing the Orthosphere® Zirconia Ceramic Implant in place.

In foot surgery, similar operative techniques for arthritic metatarso-phalangeal and interphalangeal joints also have been described.^{9,13} These include arthroplasty with placement of implants such as the Swanson titanium Hemi-implant®, La Porta implant®, Acumed Great Toe System®, and the Sagarlato® implant. These implants are indicated for metatarso-phalangeal joint arthritis but are not amenable for mid-foot (tarso-metatarsal joint) arthroplasty.

There is little described in the literature on the preservation of arthritic fifth TMTJ's. Due to the joint's necessary tri-plane range of motion, fusion is rarely acceptable. When conservative measures and joint debridement fail, the Orthosphere® Zirconia Ceramic Implant arthroplasty is an acceptable form of joint salvage in an arthritic fifth tarso-metatarsal joint.

Acknowledgements

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References:

1. Orthosphere, Wright Medical Technology, Inc. Arlington, Tennessee, 2001.
2. Roman, L.A., Pianist Who Can Perform Again Gives Orthosphere a Thumbs-Up, Memphis Business Journal, 9/14 1999.
3. Anderson D., Lateral Column Interpositional Arthroplasty of the Foot; Miller Orthopaedic Clinics, Charlotte, NC., Wright Medical Technology, Inc., 2001.
4. Ponerance J., Thumb Ball, Northwest Community Hospital, WGN-TV, Aug. 15, 2003.
5. Marion M., Lending a Healthy Hand, House Call, St. Joseph Medical Center's , December 2003.
6. Ronald H., Surgeon First in State to Implant Orthosphere, Better Health, Fall 1999.
7. Goldfarb C.A., Stern P.J., , Metacarpophalangeal joint arthroplasty in RA, JBJS, Vol. 52: pp. 163-74. 2003; Review.
8. Bezwada HP, Sauer ST, Hankins ST, Long-term results of trapeziometacarpal silicone arthroplasty. J Hand Surg; May 2002; 27(3): 409-17.
9. Cannale, S. T., Campbell's Operative Orthopaedics;, Vol. I; pp. 450-7, 1998.
10. Leon Watkins, Pocket of Podiatrics, , 3rd ed., pp. 423-430; 2001
11. Root, ML, Orien PW, Weed JH., Functional Foot, Vol. 2, pp. 48-53; 1977.
12. Callandruccio, JH, and Jobe, MT; Orthosphere: Spherical Interpositional Arthroplasty:
13. Mann, R.A, Coughlin JM., Surgery of the Foot and Ankle;, 7th ed. pp. 560-650, 1999.
14. Bertlet, G. C. and AndersonR. B., Tendon Arthroplasty For Basal Fourth and Fifth Metatarsal Arthritis; Foot and Ankle International, vol. 23, PP. 440-446, May 2002.