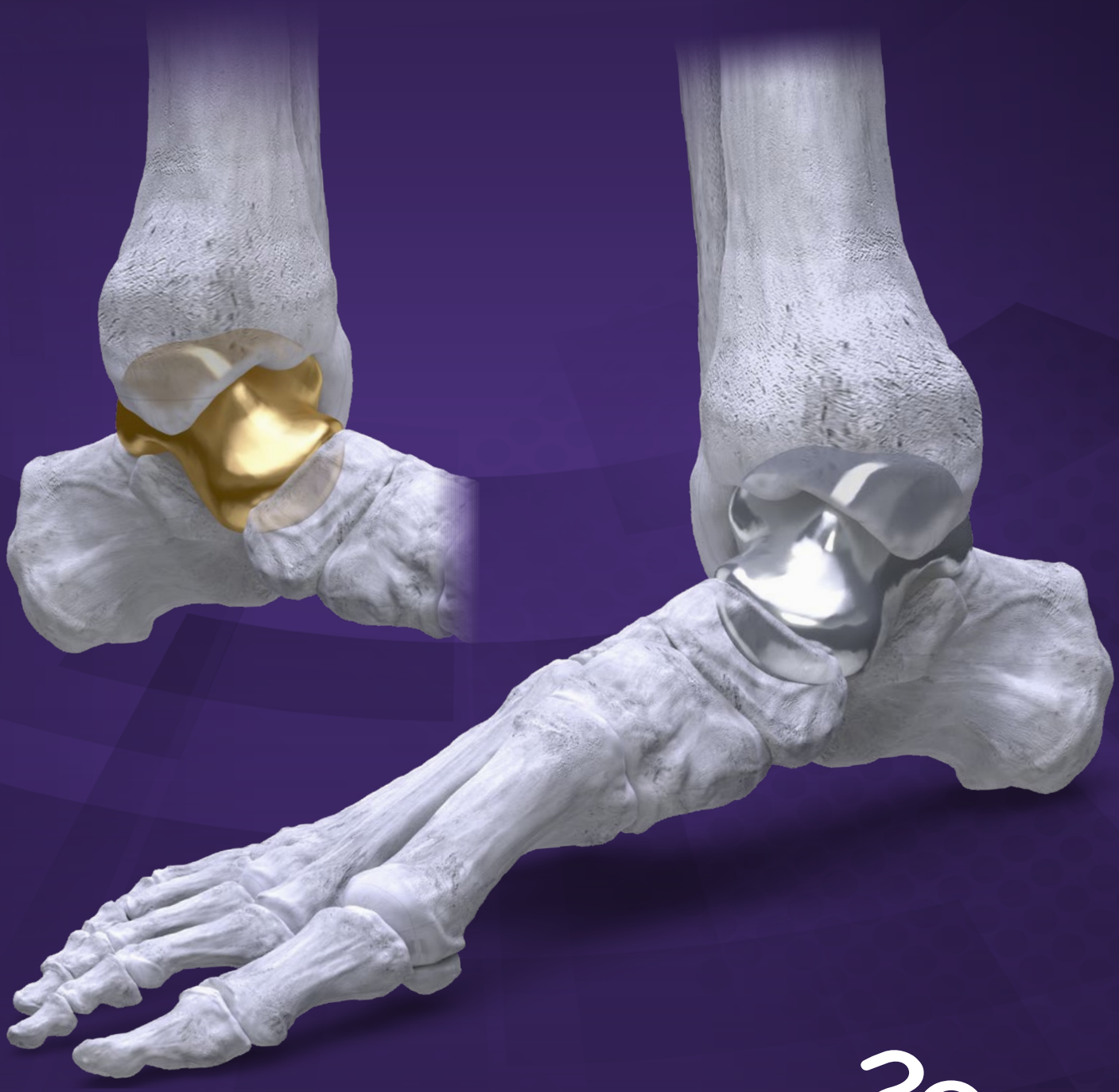
PATIENT INFORMATION GUIDE

Patient Specific Talus Spacer



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Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

Exclusively foot & ankle

Paragon 28®

Humanitarian Device. Authorized by Federal law for use in the treatment of avascular necrosis of the ankle joint in adult patients. The effectiveness of this device for this use has not been demonstrated.

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Humanitarian Device. Authorized by Federal law for use in the treatment of avascular necrosis of the ankle joint in adult patients. The effectiveness of this device for this use has not been demonstrated.

GLOSSARY

Additive Manufacturing:
Also known as 3D Printing, Additive Manufacturing is the technology process that builds a three-dimensional object by depositing materials layer by layer using data from computer aided design (CAD) models. It allows for the creation of complex geometries and patient specific designs.

Ankle Joint:
A joint in the lower limb formed by the bones of the leg (tibia and fibula) and the foot (talus). It allows dorsiflexion and plantarflexion (up and down movement) of the foot. Please see the image of the foot and ankle on page 4.

Arthrodesis:
Also known as a fusion, it is the surgical immobilization of a joint so the bones grow solidly together.

Avascular Necrosis:
The death of bone tissue due to a lack of blood supply. Also called AVN or osteonecrosis, it can lead to tiny breaks in the bone and the bone's eventual collapse.

Calcaneus:
The large bone forming the heel. It articulates with the cuboid bone of the foot and the talus bone of the ankle. Please see the image of the foot on page 4.

CT Scan:
A computerized tomography (CT) scan combines a series of X-ray images taken from different angles around your body and uses computer processing to create cross-sectional images (slices) of the bones, blood vessels and soft tissues inside your body. CT scan images provide more-detailed information than plain X-rays.

Dorsiflexion:
Movement of the foot in an upward direction.

MRI:
Magnetic Resonance Imaging (MRI) is a medical imaging technique that uses a magnetic field and computer-generated radio waves to create detailed images of the organs and tissues in your body.

Navicular:
A bone in the ankle located between the talus and the cuneiform bones. Please see the image of the foot on page 4.

Patient Specific Implant:
An implant that has been designed to match the patient's own anatomy. They are used in the medical field to repair a range of bone structures because they can be made to fit the patient's physical characteristics

Plantarflexion:
Movement of the foot in which the foot or toes flex downward toward the sole of the foot.

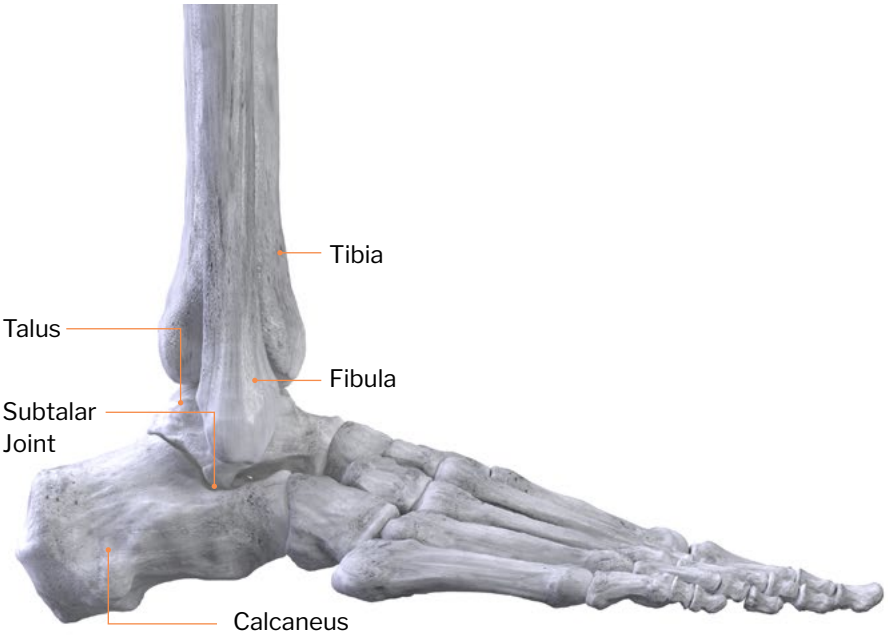
Talus:
The large bone in the ankle connecting the leg and foot, and enabling movement. Please see the image of the foot on page 4.

Tibia:
The inner and typically larger of the two bones in the lower leg, between the knee and the ankle, often referred to as the shin bone.

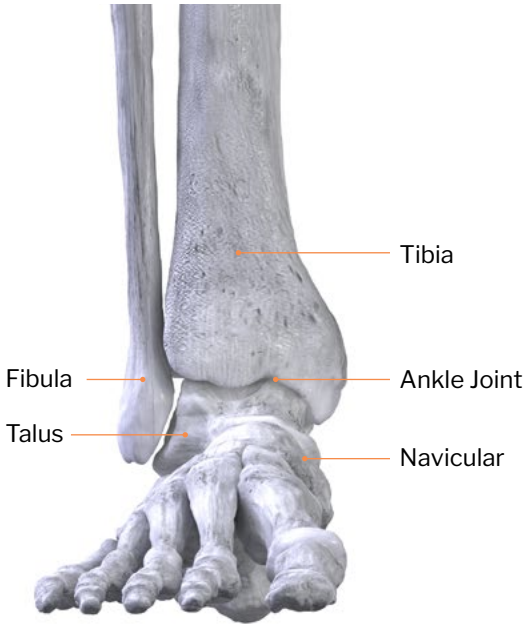
THE ANKLE JOINT

The ankle is made up of two joints: the ankle joint and the subtalar joint. The ankle joint is comprised of three bones: the tibia (shinbone); the fibula; and the talus. The ankle joint allows dorsiflexion and plantarflexion of the foot, or movement in an up-and-down motion.

The subtalar joint, which consists of the talus on top and calcaneus on the bottom, is located beneath the ankle joint. The subtalar joint allows the foot to move in a side-to-side motion. Along with articular cartilage, ligaments, tendons, and muscles of your lower leg, these components work together to provide the stability, strength, and movement to allow you to walk, run, and jump.



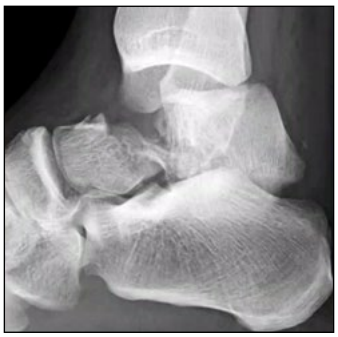
Lateral (Outside) View



Anterior (Front) View

WHAT IS AVASCULAR NECROSIS?

Avascular necrosis (AVN) is the death of bone tissue due to a lack of blood supply. Eventually the bone will collapse. If AVN involves the bones of a joint (like the talus) it often leads to destruction of cartilage, resulting in arthritis and pain. Avascular necrosis can be caused by a sudden bad injury, such as a broken bone or dislocated joint, or an injury that occurs slowly over time, such as long-term use of high-dose steroid medications or excessive alcohol intake. Anyone can be affected by AVN, but it is most common in people between the ages of 30 and 50.



Example X-ray of a patient with a talus fracture due to a traumatic injury

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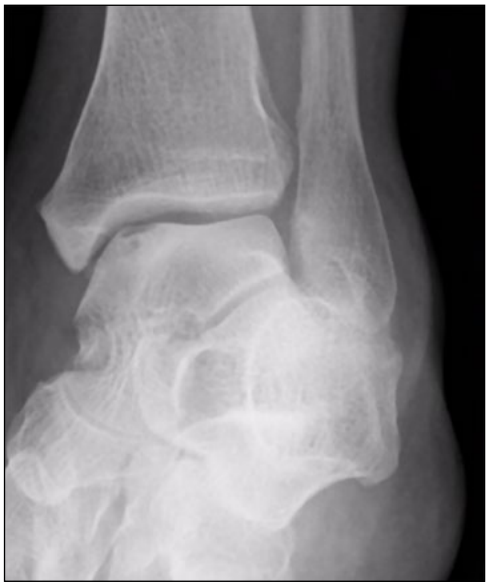
SYMPTOMS OF AVASCULAR NECROSIS OF THE ANKLE JOINT

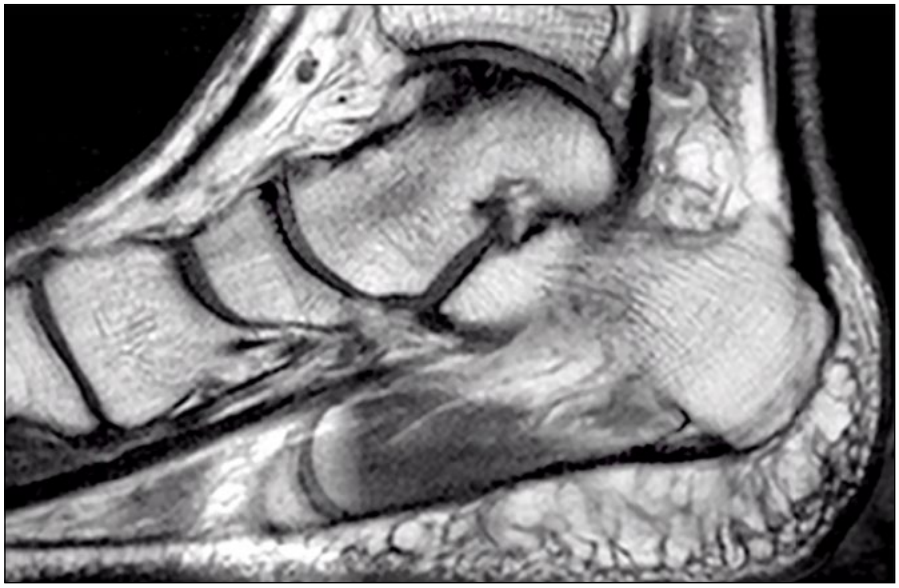
Many people have no symptoms in the early stages of avascular necrosis. As the condition worsens, your affected joint might only hurt when you put weight on it. Eventually, you may feel pain when you are lying down. Pain may be dull, mild, or severe and usually develops gradually. Avascular necrosis of the ankle joint can be quite devastating and can lead to total loss of the ankle joint with pain, arthritis, and deformity.

DIAGNOSIS AND TREATMENT OPTIONS

Your doctor will take X-rays if he or she suspects you may have avascular necrosis. Following X-rays, Magnetic Resonance Imaging (MRI) or CT scans will likely be ordered. MRI and CT images are more sensitive than X-rays and are better at helping your doctor identify pathology.



AVN of the talus as viewed on X-ray



AVN of the talus as visualized on MRI

Your treatment options will depend on the severity of the avascular necrosis. If AVN is noted in an early stage, non-operative or early stage surgical treatment options may be available. Early stage surgical intervention may include core decompression or bone grafting.

In late stage AVN, if the talus has begun to collapse or has fully collapsed, surgical intervention is required. Surgical treatment options may include an arthrodesis, or fusion, of one or more joints in the foot and ankle. An arthrodesis eliminates movement at that joint, which assists in relieving pain. Another option is an amputation, where your doctor will surgically remove the lower portion of your limb below the knee. An additional treatment option is available, which is a talus replacement surgery. During this procedure the talus bone is removed and replaced with Patient Specific Talus Spacer. This is considered a joint-sparing procedure, as it allows you to maintain motion of your ankle joint.

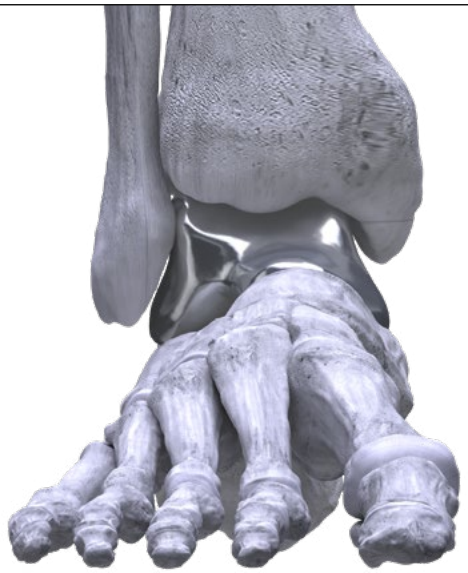
WHAT IS A 3D PRINTED PATIENT SPECIFIC TALUS SPACER?

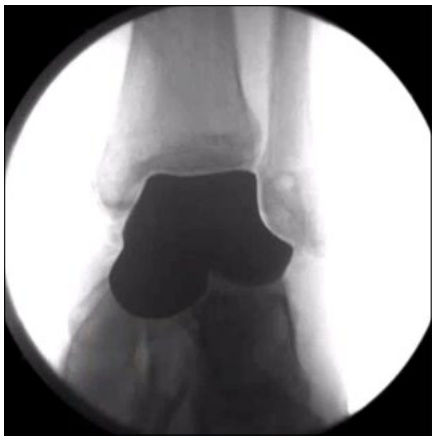
The Patient Specific Talus Spacer is an additively manufactured, or 3D printed, patient specific implant that is designed and made individually for each patient using CT image data. The device allows you to regain motion and reduce pain without an amputation or fusion for the treatment of the current condition. The talus implant is designed to match your specific anatomy. The Patient Specific Talus Spacer has two material options: a cobalt chromium metal alloy and a titanium alloy with a titanium nitride coating. The Patient Specific Talus Spacer in cobalt chromium is an additively manufactured implant made from cobalt chromium metal alloy and produced by laser sintering. The Patient Specific Talus Spacer in titanium alloy is an additively manufactured implant made from titanium alloy with a titanium nitride coating and produced by electron beam melting. Your doctor will select which material is best suited for you.

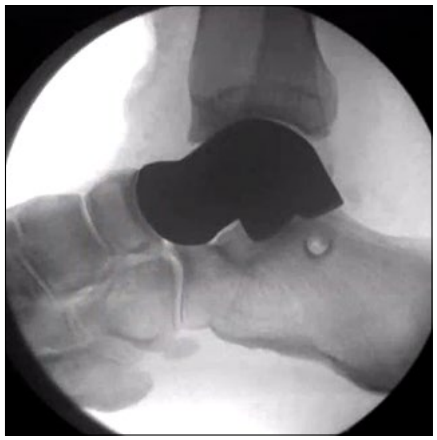
Material	Benefit	Drawback
Cobalt-Chromium	• Preferred if patient has a known sensitivity or allergy to titanium.	• Heavier implant than equivalently size titanium implant. • May illicit negative response in patients with cobalt and/or chromium allergies. • Nickel content 0.5%.
Titanium	• Preferred if patient has a known sensitivity or allergy to cobalt, chromium or nickel. • Lighter implant than equivalently sized CoCr implant.	• May illicit negative response in patients with titanium allergies.

Paragon 28® Patient Specific Talus Spacer, shown in Titanium with TiN Coating

Paragon 28® Patient Specific Talus Spacer, shown in CoCr







Paragon 28® Patient Specific Talus Spacer as visible on X-ray

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WHO SHOULD BE TREATED WITH A PATIENT SPECIFIC TALUS SPACER?

The Paragon 28® Patient Specific Talus Spacer is indicated for avascular necrosis of the ankle joint. In addition to reading the information provided in this guide, please talk with your doctor. Your doctor will help you to understand the benefits and risks associated with the procedure and determine if you are a candidate for a Patient Specific Talus Spacer implant.

WHO SHOULD NOT RECEIVE A PATIENT SPECIFIC TALUS SPACER?

If you have been diagnosed with or are experiencing any of the following conditions, it is recommended you do not receive a Patient Specific Talus Spacer:

- Use of implant greater than 6 months from date of patient's CT scan.
- Degenerative changes in the tibiotalar, subtalar or talonavicular joints.
- Presence of an active infection.
- Gross deformity in sagittal or coronal planes. More than 15 degrees of varus or valgus deformity in the coronal plane, or more than 50% subluxation anteriorly or posteriorly of the talus in the sagittal plane.
- Osteonecrosis of the calcaneus, distal tibia or navicular.
- Known history of existing malignancy, or any systemic infection, local infection, or skin compromise at the surgical site.
- Blood supply limitations and previous infections that may prevent healing.
- Physical conditions that would eliminate, or tend to eliminate, adequate implant support or prevent healing including inadequate soft tissue coverage.
- Conditions which may limit the patient's ability or willingness to restrict activities or follow directions during the healing period.
- Sensitivity or allergy to the metal implant. Where material sensitivity is suspected, appropriate tests should be made, and sensitivity ruled out prior to implantation.

WHAT ARE THE WARNINGS ASSOCIATED WITH A PATIENT SPECIFIC TALUS SPACER?

- Surgeons must evaluate the patient's contralateral side in addition to the affected talus, to determine if the patient is a candidate for a Patient Specific Talus Spacer. If the surgeon believes there are deformities on the affected side or the contralateral side, then the patient may not be a suitable candidate for a Patient Specific Talus Spacer.
- It is mandatory that the user, surgeon and surgery personnel are acquainted with the respective-surgical technique and implants used.

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- The trained expert staff is obligated to examine the surgical implant and its packaging for damages prior to each application, i.e., use in case of the implant or its packaging being damaged or deformed, it is not to be used.
- Improper selection, placement, positioning, alignment and fixation of the implant may result in unusual stress conditions and a subsequent reduction in the service life of the prosthetic implant.
- Malalignment or inaccurate implantation can lead to excessive wear and/or failure of the implant or procedure.
- Inadequate preclosure cleaning (removal of surgical debris) can lead to excessive wear.
- Improper preoperative or intraoperative implant handling or damage (scratches, dents, etc.) can lead to crevice corrosion, fretting, fatigue fracture and/or excessive wear.
- Do not modify the Paragon 28® Patient Specific Talus Spacer.
- The surgeon is to be thoroughly familiar with the Patient Specific Talus Spacer and surgical procedure prior to performing surgery. For further information, contact Paragon 28® and consult the Surgical Technique Guide.
- Do not reuse the Paragon 28® Patient Specific Talus Spacer. Reuse of this product may result in infection or other systemic complications that may affect the patient's overall health. Additionally, the reuse of this product could adversely affect function of the device. Any implant that has been damaged, mishandled, or removed from the sterile field may have surface damage that could result in implant fracture and/or particulate and should be discarded.
- This is a patient specific implant, do not use in a patient other than the one listed in the product labeling and/or the physician order form.

WHAT ARE THE PRECAUTIONS ASSOCIATED WITH A PATIENT SPECIFIC TALUS SPACER?

- Surgical implants may only be used for surgeries, for which the designated application of the implant is explicitly necessary and defined.
- Correct selection of the implant is extremely important. That patient's anatomy and indication will determine the size of the implant to be used.
- No partial weight-bearing or non-weight bearing device can be expected to withstand the unsupported stresses of full weight-bearing. Following surgery, the patient should employ adequate external support and restrict physical activities which would place stress upon the implant or allow movement of the implant and delay healing.
- Postoperative care is extremely important. The patient must be warned that noncompliance with postoperative instructions could lead to breakage of the implant or surrounding bones in the ankle joint. The risk of device failure may increase due to patient-related factors including activity level, weight, or noncompliance due to psychological condition.
- Patient Specific Talus Spacers are designed from patient data such as radiograph (X-ray), CT scans, or magnetic resonance imaging (MRI). Over time, a patient's anatomy can change. If a significant amount of time has elapsed from the time of collection of the patient data (date of scan) to the time of surgery utilizing a Patient Specific Talus Spacer, the implant may not fit the patient's anatomy correctly.

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WHAT ARE THE RISKS ASSOCIATED WITH THIS TYPE OF SURGERY?

As with any surgery, there can be risks which include:

- Anesthesia
- Skin problems
- Bleeding
- Infection
- Blood clots
- Nerve/blood vessel damage

WHAT ARE THE POTENTIAL ADVERSE EFFECTS OF A PATIENT SPECIFIC TALUS SPACER?

As with any surgical procedure, complications may occur when you are treated with a Patient Specific Talus Spacer. Various adverse events that could be related to this type of device or procedure include:

- Infection, deep and superficial
- Loosening or migration of the implant
- Nerve damage due to surgical trauma
- Inadequate healing
- Pain, soft tissue discomfort or abnormal sensation due to the presence of the device
- Deep and superficial infections
- Allergies or other reactions to implant materials
- Loss of anatomic position with rotation or angulation
- Bone resorption or over-production
- Untoward histological responses possibly involving macrophages and/or fibroblasts
- Migration of particle wear debris possibly resulting in a bodily response
- Embolism

WHAT ARE THE EXPECTED OUTCOMES AND BENEFITS OF A PATIENT SPECIFIC TALUS SPACER?

The Patient Specific Talus Spacer is expected to provide pain relief and preserve motion and stability of the ankle joint.

You should speak to your doctor to see if you are a candidate for a Patient Specific Talus Spacer.

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PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

Data from 32 cases in 31 patients were evaluated to demonstrate the safety and probable benefit of the Patient Specific Talus Spacer when used in the indicated population. The data collection was approved by the Duke University Institutional Review Board.

The primary safety endpoint was the proportion of patients who underwent a secondary subsequent surgical intervention ("SSSI"). Other safety endpoints assessed included adverse events ("AEs"), device or procedure related AEs, AEs by severity, and serious AEs ("SAEs").

The probable benefit endpoint was the reduction in baseline level pain following surgery using the Visual Analog Scale ("VAS") for pain. The secondary probable benefit endpoints assessed included ankle range of motion ("ROM") and Foot and Ankle Outcome Scores ("FAOS"). FAOS subscales, pain, symptom (stiffness, swelling, etc.), activities of daily living ("ADL"), ability to perform sports and recreational activities ("Sport/Rec"); and foot/ankle-related quality of life ("QoL") were also assessed.

A summary of the patient demographics is provided below in Table 1.

Thirty-one (31) patients were treated for a total of 32 operations; 1 patient had a Patient Specific Talus Spacer implanted in both the left and right ankles.

Table 1: Patient Demographics

AGE (n=31)	
Mean ± SD	43 ± 15.3
Range	20 - 69
GENDER (n=31)	
Male, n (%)	8 (25.8%)
Female, n (%)	23 (74.2%)
BMI (n=31)	
Mean ± SD	31 ± 6.96
Range	20 - 48
SMOKING STATUS (n=31)	
Current, n (%)	4 (12.9%)
Former, n (%)	3 (9.7%)
Never a smoker, n (%)	24 (77.4%)
LATERALITY (n=32)	
Left, n (%)	17 (54.8%)
Right, n (%)	13 (41.9%)
Both, n (%)	1 (3.2%)
PRIOR SURGERIES (n=31)	
0, n (%)	15 (48.4%)
1, n (%)	9 (29.0%)
2, n (%)	5 (16.1%)
≥ 3, n (%)	2 (6.5%)

PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

Safety

Adverse event data was collected during the study. Three (3) related adverse events were reported in 3 cases: 2 pain events related to the treatment and 1 scar tissue formation event related to the treatment that resulted in a superficial peroneal neuroma.

A table of related adverse events is provided below:

Table 2: Related Adverse Events

	AEs	Total Patients with AEs n (%)
Any AE	3	3 (9%)
GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS		
Chills	0	0%
Impaired Healing	0	0%
MECHANICAL COMPLICATION OF THE IMPLANT		
Pain	2	2 (6%)
Pyrexia	0	0%
Wound Necrosis	0	0%
INFECTIONS AND INFESTATIONS		
Infection	0	0%
Superficial	0	0%
Deep	0	0%
INJURY, POISONING AND PROCEDURE COMPLICATIONS		
Loosening of the device	0	0%
Fracture	0	0%
Inury	0	0%
Joint Injury	0	0%
Post procedural haematoma	0	0%
MUSCULOSKELETAL AND CONNECTIVE TISSUE DISORDERS		
Myositis	0	0%
Soft Tissue Necrosis	0	0%
Scar Tissue	1	1 (3.1%)
SKIN AND SUBCUTANEOUS TISSUE DISORDERS		
Blister	0	0%
Skin Necrosis	0	0%

PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

In addition, there were 3 reoperations reported in 3 of 32 cases (9.4%). Two (2) of the reoperations are unrelated to the Patient Specific Talus Spacer or the associated procedure, and are most likely due to pre-existing comorbidities, while 1 reoperation was related to the treatment and is associated with the scar tissue reported in Table 1 above. In one patient, irrigation and debridement of tissue near the surgical site was required 6 months after the surgery to promote healing of the infected tissue and contracture with tibial anterior release. The infection was associated with a prior surgery for a vascularized pedicle graft. Approximately 3 years after the procedure, a below the knee amputation was performed to address an underlying neurological condition. The reoperation for this patient is not related to the treatment. Another patient underwent surgical treatment of superficial peroneal neuroma ("SPN") after implantation of the device. Although neuromas are generally uncommon, they may occur after direct trauma or operation. This event was classified as possibly related to the treatment procedure. The third patient experienced progression of talus AVN to tibial AVN, after implantation of the Patient Specific Talus Spacer. This patient presented pre-operatively with cancer with widespread AVN in lower right extremity. The patient ultimately underwent revision surgery with a total ankle replacement ("TAR"). Chronic pain, including prior to the Patient Specific Talus Spacer procedure, was a long-term problem for this patient, thus it was not related to the treatment.

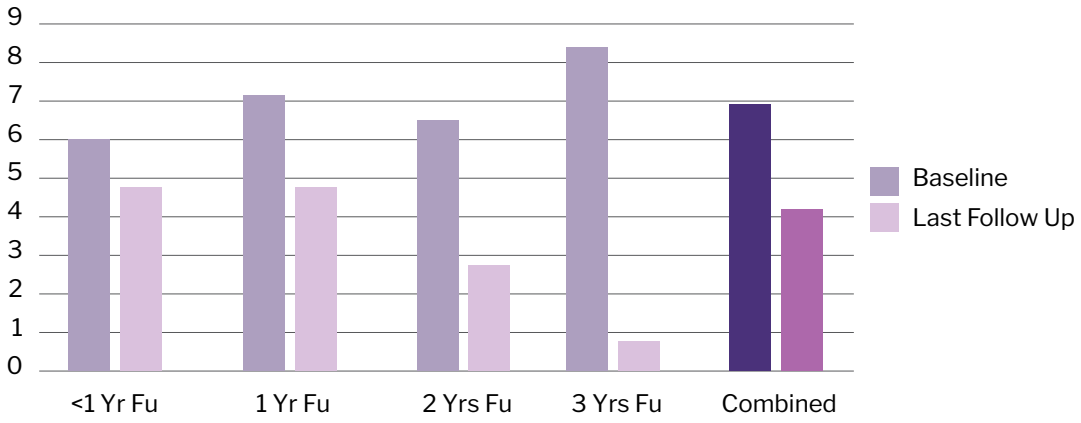
PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

Probable Benefits

VAS pain scores were assessed prior to treatment and at the most recent follow-up time point, as shown in Figure 1. The total study population, as well as each cohort, experienced mean improvement on VAS pain; across cohorts the magnitude of the improvement was positively correlated with the duration of follow-up.

At baseline, the mean VAS score for the study population was 6.9 cm ± 2.0 and scores ranged from 3-10 cm, with 10 representing maximum pain intensity. Mean change from baseline for the entire study population was -2.8 cm ± 3.1. For the cohort analysis, mean improvement from for the <1 year, 1 year, 2 years, and 3 years cohorts was -1.2 cm ± 2.7, -2.2 cm ± 2.8, -3.7 cm ± 2.3, and -7.7 cm ± 3.2. Thus, improvement on VAS pain was consistent across duration of follow up. As anticipated, due to the lengthy recovery period associated with this patient population, VAS pain outcomes improved on average the longer the follow-up period.

Figure 1: VAS Pain (cm) - Mean Baseline and Last Follow-Up by Duration of Follow-up

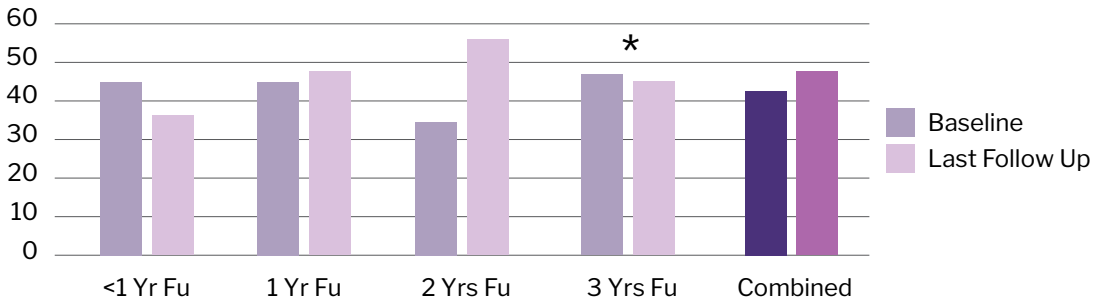


PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

Ankle ROM values were assessed for each patient, and reported based on the last follow-up data (Figure 2). The data summary presents outcomes for the entire study population, as well as by cohort based on duration of follow-up period (i.e., < 1 year, 1 year, 2 years, and 3 years).

As anticipated, patients still in active recovery from the device procedure (i.e., < 1 year of follow up) reported deterioration from baseline; the other cohorts either reported mean improvement or no change. When patients with < 1 year of follow up are excluded from the study population the mean improvement for the remaining subjects is 5.9 degrees. Patients with 2-year follow-up data showed the greatest mean improvement in ankle ROM compared to baseline (25 degrees).

Figure 2: Ankle ROM - Mean Baseline and Last Follow-Up by Duration of Follow-up

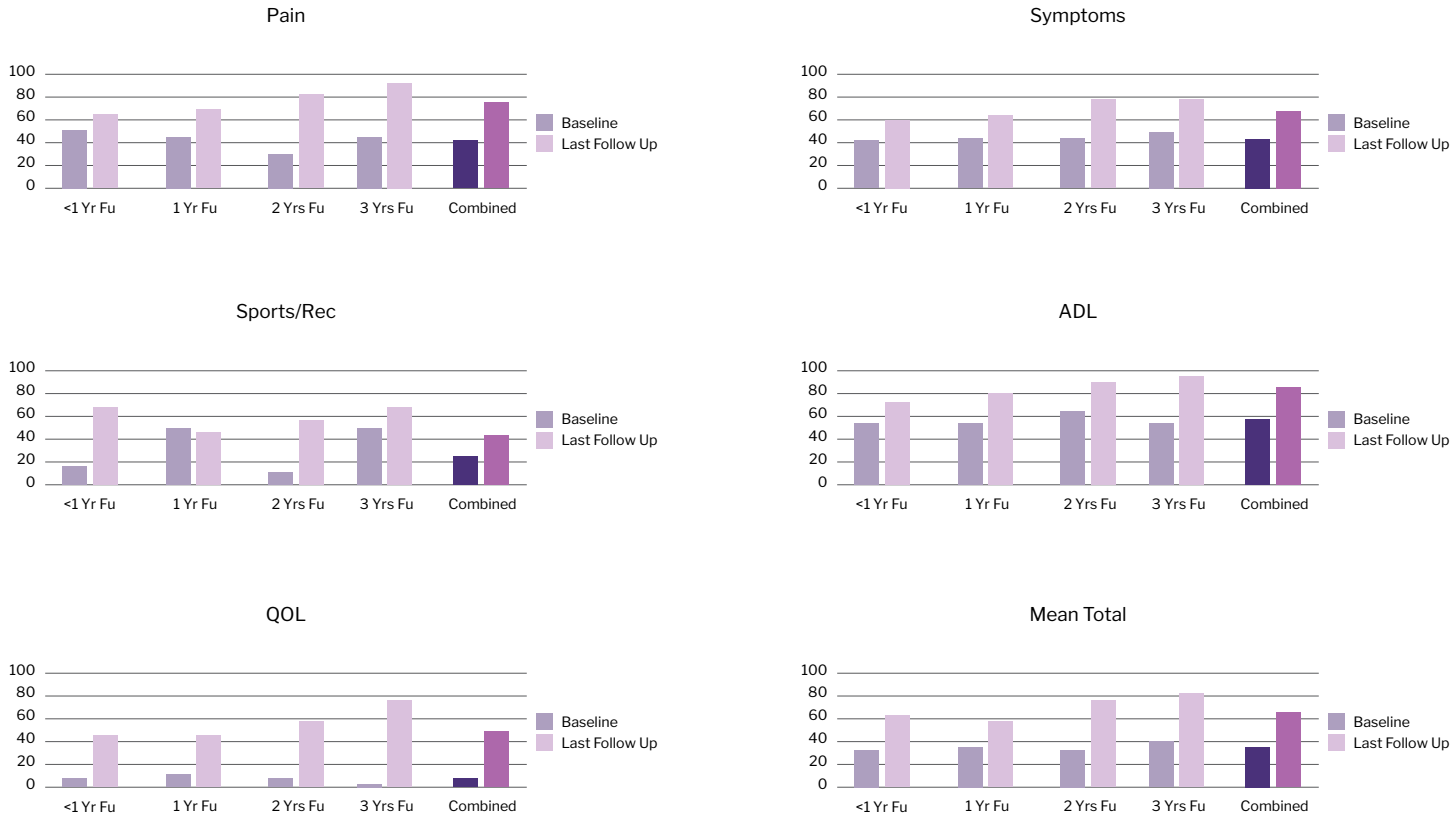


*In the 3 Yr Cohort, the figure shows mean ROM at last follow up (n=2) is lower than baseline (n=3), however, when analyzing within subject change from baseline (n=2) the mean change is zero.

Average combined FAOS score, as well as each separate subscale (Pain, Symptoms, Sport/Rec, ADL, and QoL), were assessed pre-operatively and post-operatively. The mean change for FAOS average combined score and each subscale are reported with the last follow-up data combined (Figure 3). The data summary presents outcomes for the entire study population. As seen in Figure 3 below, patients showed an increase for each subscale at the last follow up.

PATIENT SPECIFIC TALUS SPACER CLINICAL DATA

Figure 3: Mean FAOS Subscales Mean Baseline, Last Follow-Up and Change from Baseline by Duration of Follow-up



Conclusion

The patients who were implanted with the Patient Specific Talus Spacer in the above study received a clinically meaningful probable benefit from the device. As discussed above, baseline VAS pain score were reduced by -2.8 cm postoperatively, from 6.9 cm (moderate to severe pain) to 4.1 cm (mild pain). ROM also improved on average, especially when limiting the analysis to those patients who had at least 1 year of follow-up and thus had adequate time to rehabilitate. Functional outcomes based on FAOS subscales also improved, with average improvement on all subscales exceeding the associated MIC threshold except Sport/Rec. Moreover, the rate of reoperation was low, with 9.4% of cases resulting in reoperation. Improvement in pain and function measures, accompanied by a low rate of reoperation, is particularly meaningful to AVN talus patients who have limited options and high risk of needing to undergo fusion or amputation. The favorable probable benefit to risk profile of the device is further demonstrated by the activity levels reported for some patients post-operatively, which include returning or continuing in their career, engaging in recreational activities, and returning to walking.

WHAT HAPPENS DURING A PATIENT SPECIFIC TALUS SPACER SURGERY?

After being administered anesthesia, your surgeon will make an incision on the anterior, or front, of your ankle. He or she will use surgical instruments to remove your talus bone, and will then insert the Patient Specific Talus Spacer that was designed for your anatomy. Your surgeon will confirm the fit of the implant under X-ray imaging, and will then close the incision and apply a post-operative bandage.

WHAT HAPPENS AFTER A PATIENT SPECIFIC TALUS SPACER SURGERY?

Your doctor will talk with you about your post-surgery recovery. Your doctor will want to see you back at the office to check your incision and your wound at one week and two weeks post-operative. You will remain non-weightbearing with a cast or splint on your foot for 3 weeks. Then you will be weightbearing as tolerated with a CAM walker boot for 3 weeks. At 6 weeks from your surgery you will be back in a regular shoe doing physical therapy. Your doctor will continue monitoring your healing progression on regular intervals for the first year then annually after one year. Please discuss with your doctor when you may resume certain physical activities.

WHEN SHOULD I CALL THE DOCTOR AFTER SURGERY?

Please talk to your doctor about when you should call regarding any problems after surgery. It is normal to experience some pain and discomfort after surgery. If you experience increased pain, surgical site infection, or any other medical issue at any time after surgery, please contact your doctor.

TALK TO YOUR DOCTOR

While this guide is intended to provide you with information to help you make an informed decision about your treatment options, it is not intended to provide medical device or replace professional medical care. If you have any questions about the Patient Specific Talus Spacer, please call your doctor, who is the only qualified person to diagnose and treat your foot and ankle condition. As with any surgical procedure, it is advised to select a doctor who is experienced in performing the surgery you are considering.

If you have specific questions about the Patient Specific Talus Spacer, please contact your doctor. For additional information, please visit https://paragon28.com/products/total-talus-replacement

PSTSPEG-01 RevA [2022-01-28]

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