Trabecular Metal™ Acetabular Revision System (TMARS)
Restrictors and Augments

Surgical Technique
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Introduction

**Bone Void Filler**

- Host bone is conserved while the implant size, position, and orientation are determined by the defect.

- Acetabular shell position and patient kinematics remain uncompromised, as when using structural grafts.

- The Trabecular Metal Acetabular Augment, shaped similar to a partial hemisphere, comes in four thicknesses and six sizes, allowing for fit in various defects.

- The Trabecular Metal Acetabular Restrictor is concave and comes in three diameters, allowing for coverage of medial wall defects and containment of morsellized bone graft.
**Acetabular Assessment and Preparation**

Intraoperatively, carefully assess any acetabular bone defects present (Figure 1). Note the location, extent and type of bone defect. It is equally important to assess the quality and location of the host bone that remains for support of the acetabular shell.

Use progressively larger reamers to prepare the acetabulum for the Revision Shell or other Trabecular Metal cups. Hold the reamer steady in the intended position and orientation in which the shell will be implanted (Figure 2).

Following acetabular preparation, reassess the acetabulum to evaluate the quality of bone and defect type. Determine if a Trabecular Metal Acetabular Restrictor and/or Augment is necessary. If both are deemed necessary, first place the restrictor and then the augment.
**Bone Preparation**

If augmentation is elected, minimize the removal of any additional bone in the areas of bone deficiency (Figure 3). If needed, use a hemispherical reamer or burr to smooth the surface of the defect to facilitate stable placement and impaction of the Trabecular Metal Acetabular Augment (Figure 4).

**Note:** The augment is a partial hemisphere. The smallest size reamer corresponding to an augment outer diameter size is 50 mm while the largest is 70 mm. Consider the size array of augments if choosing a reamer for defect preparation.

**Augment Sizing**

Effort should be made to provide for anatomical positioning of the shell. Use acetabular shell provisionals (Trabecular Metal Revision Shell Provisional shown in Figure 5) along with Acetabular Augment Provisionals to facilitate decision making on the proper combination and position. Choose the shell provisional that is the same size as the last reamer used. Select the augment provisional size to match the defect or the last reamer used to prepare the defect. The augment provisional can be held in place with the augment provisional forceps or a pin. Ensure maximum host bone contact against the surface of the augment provisional in order to gain maximum support for the implant.

**Note:** Each size augment provisional is available in 10, 15, 20 and 30 mm thicknesses.
Augment Insertion

Note: Trabecular Metal Acetabular Augments can be placed in a variety of positions to fit into the defect. One placement option is shown in figures 7 and 8.

Assemble the torque limiter onto the screwdriver (Figure 6).

Note: This will help prevent advancement of screw heads through the augment screw holes and stripping of the threads formed in the bone.

Insert the Trabecular Metal Acetabular Augment using the augment implant forceps. Pre-drill bone holes as needed (Figure 7).

A depth gauge can be used to aid in determining screw lengths. Hold the implant in place, and through the three screw holes provided, fix as appropriate with the 6.5 mm HGP II screws (Figure 7).

Note: Ensure careful screw placement to avoid vascular and neurological injury.

Note: The center rib screw hole on the 20 mm and 30 mm thick augments cannot be used simultaneously with the center hole on the top face (Figure 9).

Once the augment is secured and stable, evaluate its fit against the host bone and the fit of the shell provisional by reintroducing the repitition provisional in order to ensure it is adequately supported. The augment should be secured and stable against the host bone, independent of any subsequent shell implant.
Bone Grafting

Pack morsellized bone graft into the Trabecular Metal Acetabular Augment windows and around any peripheral residual gaps or bone defects in the region of the augment (Figure 10). Check the implant and bone graft position by reintroducing the provisional shell (Figure 11).

TM Revision Shell Insertion

Place bone cement in a doughy state across the concave surface of the acetabular augment that will contact the shell (Figure 12). Take care to limit the cement to this location and prevent cement from extruding into the depths of the acetabulum where it might impede bone ingrowth into the Trabecular Metal Augment. Fixation to all areas in contact with the host bone should remain uncemented. The augment is now prepared to accept a shell.

Note: Insert the shell in its proper orientation prior to cement curing (Figure 13).

Note: Shell screw holes may be aligned with the augment windows as desired (Figure 14). This accommodates securing the shell with bone screw placement through the acetabular augment. Contact between the bone screws and the augment should be avoided. Bone wax may be used to fill the center rib screw hole if unused. Bone wax may also be placed over the center rib screw head when present.
Acetabular Restrictor

Restrictor Sizing
Thread the sizing tamp onto the provisional shell handle and introduce into the acetabulum. Use the sizing tamp to select an Trabecular Metal Acetabular Restrictor implant size appropriate for adequate defect coverage (Figure 15).

Restrictor Insertion
Select the acetabular restrictor implant that matches the size selected when using the sizing tamp. The Trabecular Metal Acetabular Restrictor Inserter/Positioner can be used to facilitate placement of the restrictor into the acetabulum. Place the implant to allow a gap between the restrictor and the shell that can be filled with bone graft or cement. Impact the restrictor into final position using the restrictor sizing tamp construct (Figure 16).

Note: Some bone smoothing may be needed to allow the restrictor to sit properly. A burr or similar tool can be used prior to implant placement.

Bone Grafting
Place morsellized bone graft over the top of the restrictor and then compact with the restrictor sizing tamp assembly (Figure 17).

Note: This is necessary to avoid contact between the acetabular restrictor and the shell.

Final Preparation
The acetabulum is now ready to accept an acetabular augment, if necessary, or a shell (Figure 18).

Note: If screws will be used in the augment or shell, it is important to note the location of the restrictor so that screws do not come in contact with the restrictor.