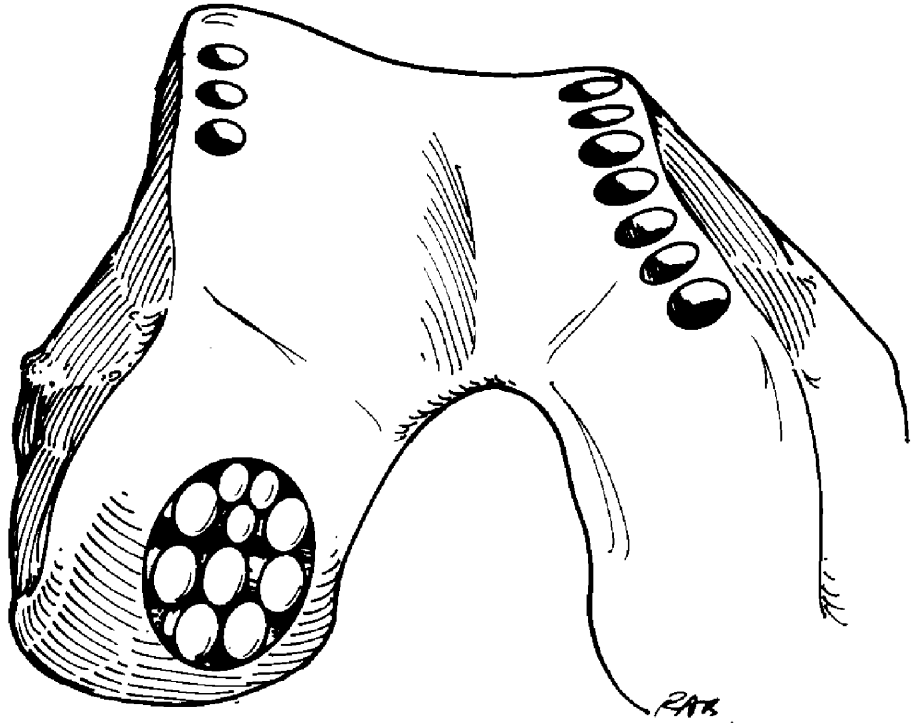


MosaicPlasty™ Osteochondral Grafting



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A Smith & Nephew Technique Plus™ Illustrated Guide

MosaicPlasty™ Osteochondral Grafting

*As described by László Hangody, M.D., Ph.D., D.Sc.
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Localized articular cartilage defects in weight-bearing joints are common, yet difficult to treat. MosaicPlasty represents a method of autogenous osteochondral transplantation for the treatment of focal cartilaginous defects secondary to biomechanical chondropathy, traumatic chondral lesions and osteochondritis dissecans of the knee and ankle. The success rate is higher for patients under age 50 due to biochemical changes in the synovial fluid that occur after age 50. (See Bibliography for references.)

This procedure can generally be performed arthroscopically for lesions of the femoral condyles when the defect is close to the intercondylar notch and does not exceed 2cm in diameter, and does not need more than 4–6 grafts. Larger defects may be treated as experience is gained with the technique.

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Overview

MosaicPlasty involves obtaining small osteochondral cylindrical grafts from the less weight-bearing periphery of the femur at the patellofemoral joint, and transporting them to the prepared defect site. With a combination of 2.7 mm, 3.5 mm, 4.5 mm, 6.5 mm, and 8.5 mm grafts, the site is filled with 70–90% transplanted hyaline cartilage. Fibrocartilage “grouting” growing upward from the prepared cancellous bed will complete the MosaicPlasty.

Postoperatively, the patient should be kept non-weight-bearing with no partial loading for 2–6 weeks and encouraged to reestablish full ROM. This time period and activity level will allow:

- The grafts to bond to surrounding bone and cartilage
- The surface to remain congruent without subsidence of the press-fit transplanted osteochondral graft.

Note: Chisels, drill guides, and trephines must be sharp. Replace drill guides and trephines when damaged or dull. For consistent results, use disposable chisels for each procedure. Cutting edge cannot be resharpened without compromising self-centering geometry of original tip.

IMPORTANT: Placing the grafts perpendicular to the surface, at the level of the original articular surface, is paramount to the success of the operation.

Patient Consent

For the most part, cartilaginous lesions are only defined at arthroscopy. If the preoperative differential diagnosis includes such a lesion, the patient should be advised of the possibility of a MosaicPlasty. The patient should be prepared for an open procedure if the site is inaccessible due to location posterior or there is inability to flex the knee sufficiently. This procedure can lead to an overnight stay and altered weight-bearing status for several weeks.

Contraindications

1. Infectious or tumor defects.
2. Generalized arthritis, rheumatoid and/or degenerative in type.
3. Those patients under the age of 50 with early unicompartment arthritis where the donor site cartilage is thin and the cartilage surrounding the defect is of poor quality.
4. In malaligned or unstable joints (varus or valgus, patellar-subluxation), restoration or joint mechanics needs to be addressed separately—or at the time of—MosaicPlasty. Patellar realignment, ACL, PCL, meniscal repair and osteotomies can be done concurrently.

Operative Preparation

1. Holding area IV antibiotics.
2. Anesthesia: General or regional, with tourniquet control.
3. Patient is positioned supine with knee capable of 120° flexion. Contralateral extremity is placed in a stirrup.
4. Standard EUA and arthroscopic survey technique.

Choosing a Procedure

An open procedure may be chosen when first performing the technique or when an arthroscopic approach is not practical due to size or location of the lesion. With the exception of this portal location, this technique applies to both open and arthroscopic procedures.

Surgical Technique

Portal Selection

Perpendicular access to the lesion is critical to proper insertion of the grafts. Care must be exercised in making the viewing and working portals.

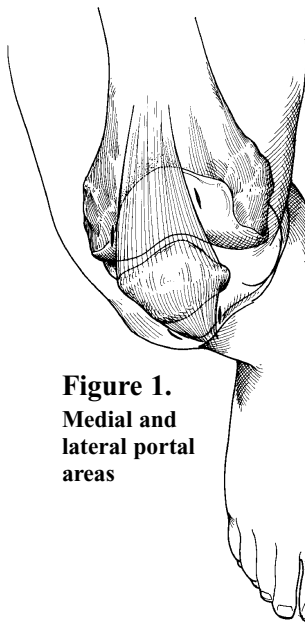


Figure 1.
Medial and lateral portal areas

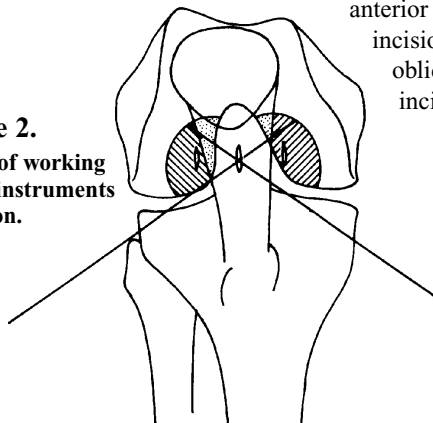
For most femoral condylar lesions, central anterior medial and central anterior lateral portals will allow correct access. Initially, a 1.2 mm K-wire or 18 gauge spinal needle can be used to locate the portal sites (Figure 1). It should be noted that these portals tend to be more central than the standard portals due to the inward curve of the condyles (Figure 2).

For osteochondritis dissecans on the medial femoral condyle the approach needs to be from the lateral side. Standard lateral portal is sometimes too oblique. Therefore, use the central patellar tendon portal which

gives good access to the inner positions of both the medial femoral condyle and the lateral femoral condyle.

If an arthroscopic approach will not be practical, it may be necessary to create a medial or lateral anterior sagittal incision, or an oblique incision.

Figure 2.
Range of working portal instruments direction.



Defect Preparation

1. With the use of a full radius resector or curette and a knife blade, the edges of the defect are brought back to good hyaline cartilage at a right angle (Figure 3).

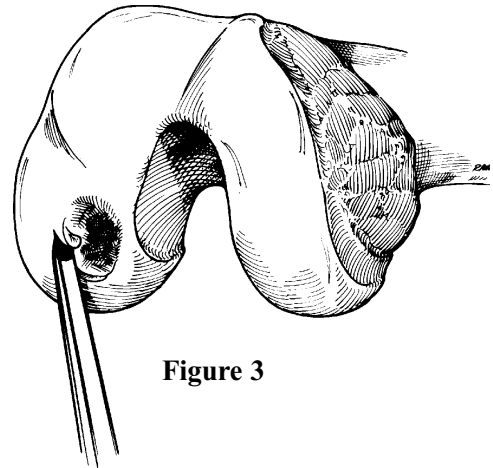


Figure 3

2. The base of the lesion is abraded to viable subchondral bone with an Abrader or half-round rasp. (Figure 4).

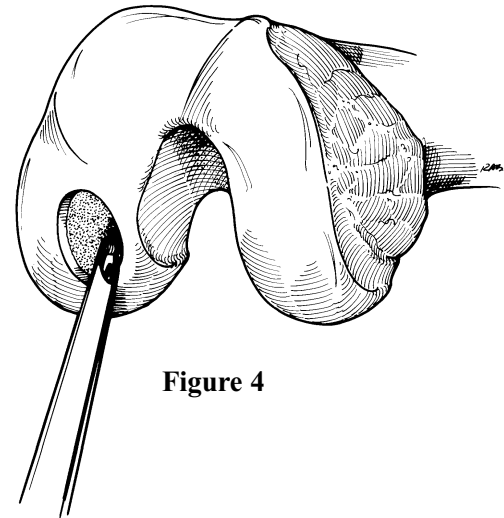
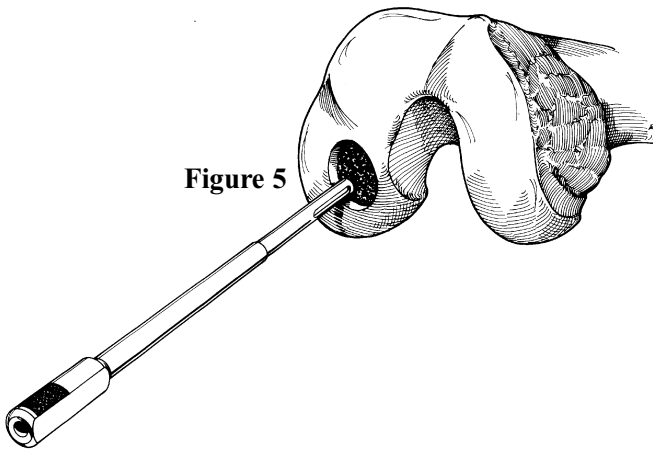


Figure 4

3. The drill guide is used to determine the number of grafts needed (Figure 5).



4. The dilator can be used to measure the depth of the defect.

Procurement of Osteochondral Grafts

The grafts can be obtained either arthroscopically or through a mini-arthrotomy (1.5–2.0 cm). If the grafts are to be taken arthroscopically, certain points are emphasized. The preferred sites are the medial femoral condyle periphery of the patellofemoral joint or the lateral femoral condyle above the sulcus terminalis above the line of the notch. If additional grafts are needed, up to three grafts may be obtained from the standard portals. If more grafts are needed or if you want to go superiorly, superomedial or superolateral portals may be necessary. Additional grafts can be harvested by flexing or extending the knee.

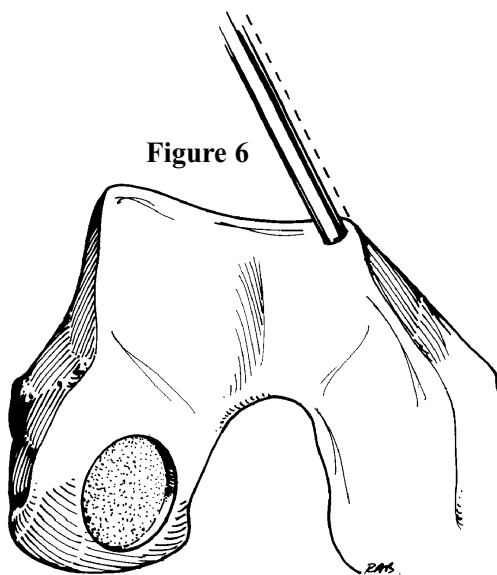
The best view for harvesting grafts from the superior portals is obtained by introducing the scope through the inferior ipsilateral portal. The lateral femoral condyle periphery through a small arthrotomy (15–20 mm) is another option for grafts.

1. A spinal needle or a K-wire is used to locate the donor site and then the portal is made.
2. The proper sized tube chisel is introduced with the harvesting tamp.
3. Once the site has been clearly identified, the chisel is located perpendicular to the articular surface (Figure 6) and driven by hammer to the appropriate depth, usually 15 mm. Generally, the length of the graft should be at least 2x its diameter. It is important to hold the chisel firmly to avoid it shifting at the cartilage/bone interface, producing a crooked graft.

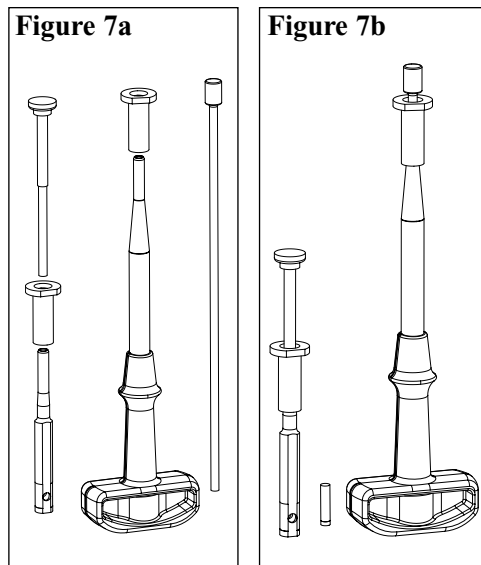
By flexing the knee, lower sites can be obtained. The lower limit is the top of the intercondylar notch.

The 4.5 mm harvesting tamp is inserted into the crosshole in the tubular chisel and used as a lever. Alternatively, the single use chisels can be used.

4. The chisel is **toggled not rotated**, causing the graft to break free at the chisel tip.



5. The grafts are ejected from the chisel by sliding the appropriate sized chisel guard over the cutting end (Figure 7a.)
6. Then using the tamp, the graft is pushed out (Figure 7b) onto gauze in a saline wetted basin.



7. Measure the harvested grafts to determine the depth necessary to drill the recipient holes in the defect site.

Spacing the grafts to avoid confluence at depth, approximately 3 mm, will avoid any weakening of the condyle. The donor site holes will eventually fill with cancellous bone and fibrocartilage. Care should be taken when harvesting 6.5 mm and 8.5 mm grafts to avoid creating patellar tracking problems or weakening the condyle.

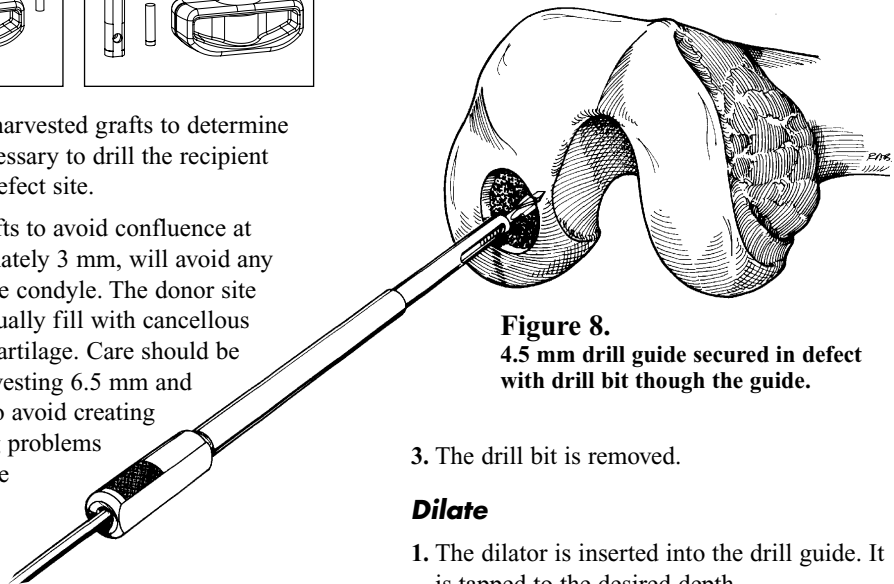


Figure 8.
4.5 mm drill guide secured in defect with drill bit through the guide.

Insertion of Osteochondral Grafts

Drill/Dilate/Deliver (3D Grafting)

Drill

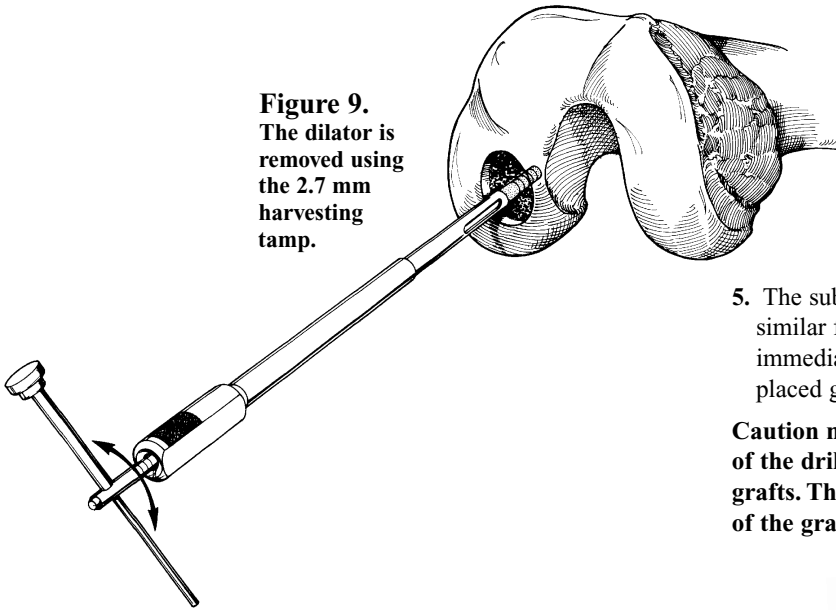
1. With the knee flexed and good distention established, the drill guide is reintroduced using the dilator as an obturator. It is placed in the defect perpendicular to the surface. By rotating the arthroscope, the drill guide and the perpendicularity of the laser mark can be seen from different angles, ensuring proper orientation. It is then tapped into the subchondral bone.
2. The appropriately sized drill bit is inserted and drilled to the desired depth, (Figure 8.) Generally, a recipient hole a few millimeters deeper than the length of the graft is desirable to minimize high intraosseal pressure. Inflow is now reduced to minimize leakage.

3. The drill bit is removed.

Dilate

1. The dilator is inserted into the drill guide. It is tapped to the desired depth.
2. While firmly holding the drill guide, the 2.7 mm harvesting tamp is inserted in the dilator and used as a lever to remove the dilator from the hole (Figure 9).

Figure 9.
The dilator is removed using the 2.7 mm harvesting tamp.



5. The subsequent grafts are inserted in a similar fashion by placing the drill guide immediately adjacent to the previously placed grafts.

Caution must be taken to keep the shoulder of the drill guide off the previously inserted grafts. This will avoid inadvertent recessing of the grafts (Figure 11).

Deliver

1. The delivery tamp should be adjusted by turning the handle to initially allow the graft to sit slightly higher than the depth of the defect. This will minimize the likelihood of overpenetrating the graft.
2. **Inflow is stopped;** otherwise fluid flow can push the graft out of the tube.
3. The graft is then delivered under direct visualization into the recipient hole through the drill guide with the use of the delivery tamp (Figure 10).
4. The graft can be inserted deeper by turning the delivery tamp handle counterclockwise. The graft should be flush with the original articular surface. The drill guide is removed to inspect the graft. If the graft is proud, the drill guide is reinserted and the graft can be tapped down gently with the tamp of the appropriate size.

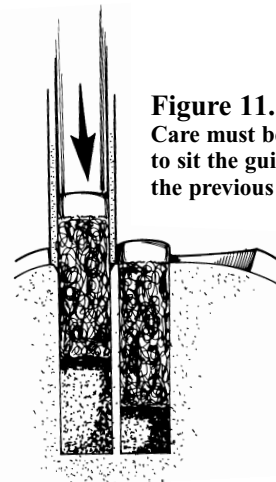


Figure 11.
Care must be taken not to sit the guide tube on the previous grafts.

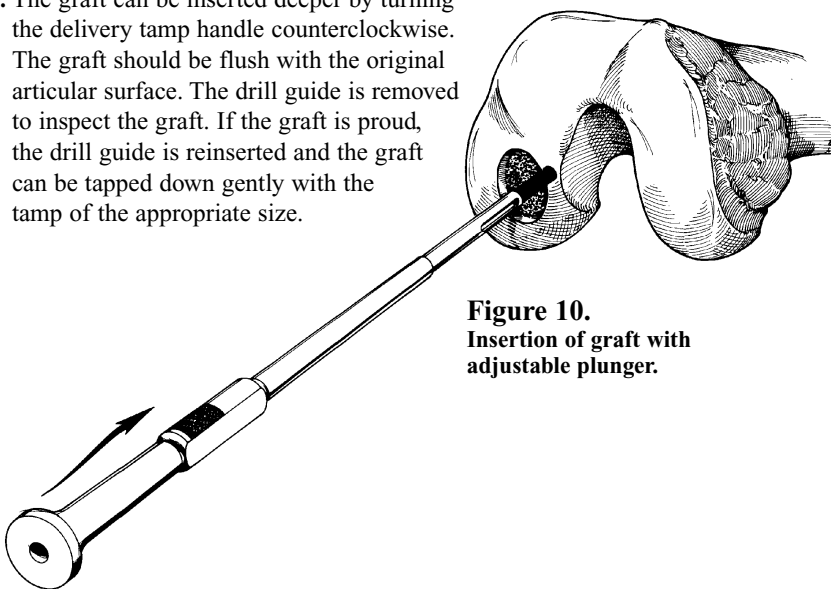


Figure 10.
Insertion of graft with adjustable plunger.

Closure and Postoperative Treatment

When all the holes are filled and the grafts seated, the knee is put through a range of motion and varus, valgus stressed (Figure 12).

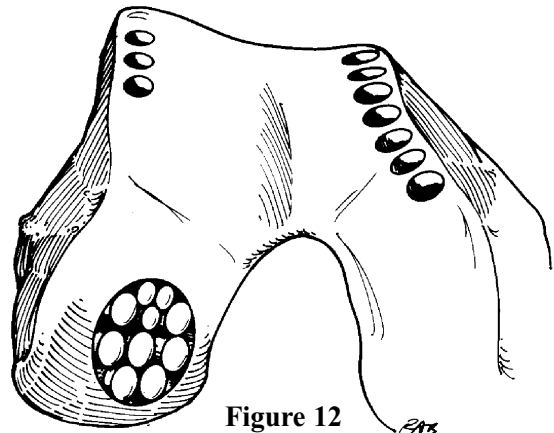


Figure 12

The portals are closed and the joint drained through superior portal.

Postoperatively, the drain is removed at 24 hours. The patient is discharged and advised to remain partial weight-bearing for 2–6 weeks, non-weight-bearing for osteochondritis dessicans. Range of motion and isometric quadriceps exercises and swimming are encouraged during this period. Barring complications, return to full activities can be accomplished in 2–4 months.

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Ordering Information

MosaicPlasty™ Systems are available as a Complete System or Precision System, and in individual components. The MosaicPlasty Complete System contains instrumentation for harvesting and placing grafts 2.7 mm, 3.5 mm, 4.5 mm, 6.5 mm, and 8.5 mm in diameter. The MosaicPlasty Precision System includes instrumentation for harvesting and placing grafts 2.7 mm, 3.5 mm, and 4.5 mm in diameter. The 6.5 mm and 8.5 mm size instrumentation are offered as options for surgeons preferring larger grafts. Both systems are suitable for open or arthroscopic surgical approaches.

The Disposable MosaicPlasty Harvesting System is a sterilized, single-use kit comprised of a Harvesting Chisel, Harvesting Tamp, and a Drill Bit.

SYSTEMS

REF	DESCRIPTION
7205532	MosaicPlasty Complete System Includes ALL components listed below, plus REF 7205507 MosaicPlasty Complete Sterilization Tray
7205605	MosaicPlasty Precision System Includes ONLY 2.7 mm, 3.5 mm, and 4.5 mm components listed below, plus REF 7205604 MosaicPlasty Precision Sterilization Tray
7209234	MosaicPlasty Disposable Harvesting System, 3.5 mm
7209235	MosaicPlasty Disposable Harvesting System, 4.5 mm
7209236	MosaicPlasty Disposable Harvesting System, 6.5 mm
7209237	MosaicPlasty Disposable Harvesting System, 8.5 mm

COMPONENTS *

GRAFT HARVESTING

Tubular Chisels (five-ten patient uses)

REF	DESCRIPTION
7207099	2.7 mm Tubular Chisel
7207098	3.5mm Tubular Chisel
7207097	4.5mm Tubular Chisel
7205493	6.5mm Tubular Chisel
7205494	8.5mm Tubular Chisel

Chisel Guards

REF	DESCRIPTION
7207208	2.7mm Chisel Guard
7207209	3.5mm Chisel Guard
7207210	4.5mm Chisel Guard
7205499	6.5mm Chisel Guard
7205500	8.5mm Chisel Guard

Harvesting Tamps

REF	DESCRIPTION
7207107	2.7mm Harvesting Tamp
7207106	3.5mm Harvesting Tamp
7207105	4.5mm Harvesting Tamp
7205495	6.5mm Harvesting Tamp
7205496	8.5mm Harvesting Tamp

GRAFT PLACEMENT

Drill Guides (five to ten patient uses)

REF	DESCRIPTION
7207214	2.7mm Drill Guide
7207215	3.5mm Drill Guide
7207216	4.5mm Drill Guide
7205501	6.5mm Drill Guide
7205502	8.5mm Drill Guide

Dilators

REF	DESCRIPTION
7205509	2.7mm Dilator
7205510	3.5mm Dilator
7205511	4.5mm Dilator
7205512	6.5mm Dilator
7205513	8.5mm Dilator

Delivery Tamps

REF	DESCRIPTION
7207205	2.7mm Delivery Tamp
7207206	3.5mm Delivery Tamp
7207207	4.5mm Delivery Tamp
7205505	6.5mm Delivery Tamp
7205506	8.5mm Delivery Tamp

SOLD SEPARATELY (NOT PART OF SYSTEM)

Trephines (optional — for hard bone)

REF	DESCRIPTION
7207089	2.7mm Trephine
7207088	3.5mm Trephine
7207087	4.5mm Trephine
7205497	6.5mm Trephine
7205498	8.5mm Trephine
7207103	Trephine Adaptor 2.7, 3.5, 4.5mm
7205515	Trephine Adaptor 6.5, 8.5mm

Drill Bits (single use only)

REF	DESCRIPTION
7205508	2.7mm Drill Bit
7207212	3.5mm Drill Bit
7207213	4.5mm Drill Bit
7205503	6.5mm Drill Bit
7205504	8.5mm Drill Bit

*Note: 10 mm components are available through Smith & Nephew's MTO ("Made To Order") program.

Additional Instruction

Prior to performing this technique, consult the Instruction for Use documentation provided with individual components — including indications, contraindications, warnings, cautions, and instructions.

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