

MARROW CELLUTION™  
BONE MARROW HARVESTING SYSTEMS

# ASPIRATE TO APPLICATION™

## *Without Centrifugation*

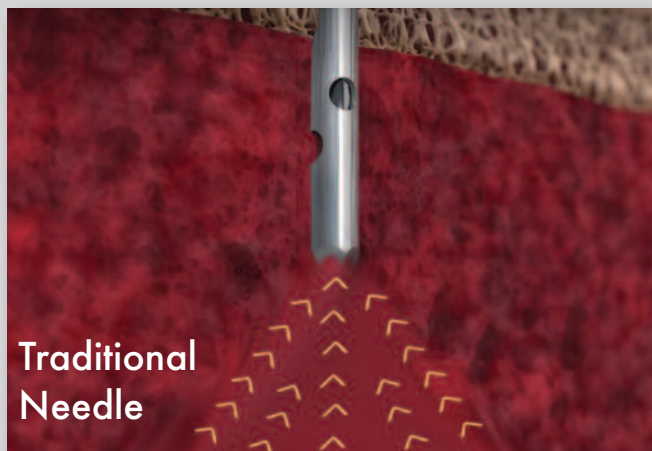
Bone Marrow Aspirate Collected  
With The Marrow Cellution™ System Has  
Shown An Increase In Key Stem And  
Progenitor Cells When Compared To  
Centrifuged Marrow From  
Leading Systems



The patent pending Marrow Cellution™ systems maximize the yield of stem and progenitor cells by giving the clinician the ability to efficiently harvest bone marrow from multiple levels within the medullary space, while restricting dilution caused by peripheral blood.

### What are the Limitations of a Traditional Needle?

Traditional bone marrow aspiration needles aspirate primarily through an open-ended cannula, which leads to excess peripheral blood dilution and inadequate collection of key stem and progenitor cells. For this reason a high volume of bone marrow aspirate must be collected and then manipulated (i.e. centrifuged) before being applied for regenerative therapies.



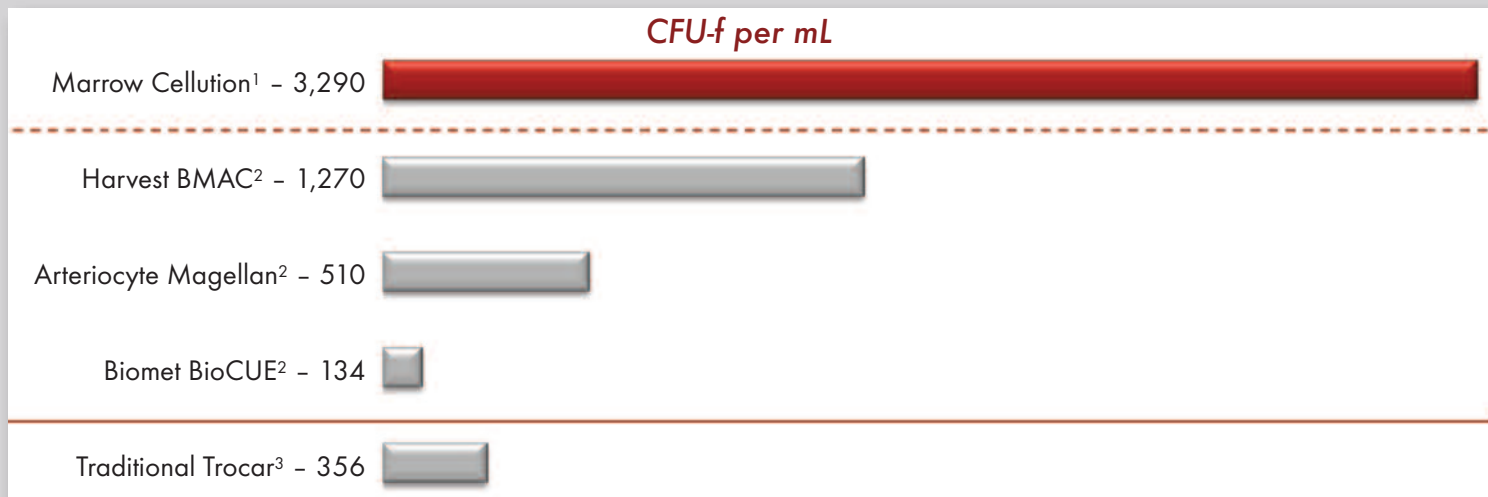
### How Does the Marrow Cellution™ System Overcome These Limitations?

The unique design of the Marrow Cellution™ system offers two key features that are not capable with a traditional needle:

- Closed-tip aspiration cannula that restricts aspiration through the side holes of the cannula and away from the channel caused by the tip of the needle, avoiding excess peripheral blood infiltration.
- A mechanical means for measured controlled retraction of the aspiration cannula to collect bone marrow aspirate from multiple geographies inside the medullary space with a single puncture.



## COMPETITIVE PERFORMANCE

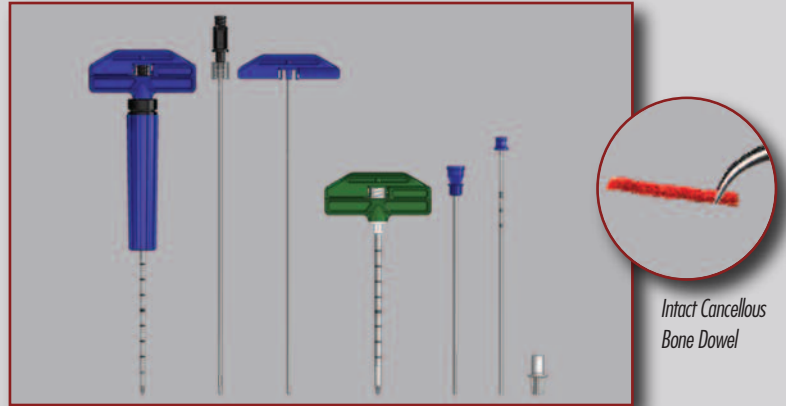


1. Scarpone M, et al. Marrow Cellution Bone Marrow Aspiration System and Related Concentrations of Stem and Progenitor Cells. White Paper 2015.  
 2. Hegde V, et al. A prospective Comparison of Three Approved Systems for Autologous Bone Marrow Concentration Demonstrated Non-Equivalency in Progenitor Cell Number and Concentration. J Orthop Trauma. 2014 Oct; 28(10):591-8  
 3. McLain R, et al. Aspiration of Osteoprogenitor Cells for Augmenting Spinal Fusion: Comparison of Progenitor Cell Concentrations from the Vertebral Body and Iliac Crest. J Bone Joint Surg Am. 2005 Dec; 87(12): 2655-2661.

# MARROW CELLUTION™ BONE GRAFTING

The high cellular composition of Marrow Cellution™ Aspirate combined with percutaneously harvested bone dowel(s) deliver autograft without the associated morbidity.

- GRAFT MATERIAL WITH OSTEOCONDUCTIVE, OSTEOINDUCTIVE & OSTEOGENIC PROPERTIES.
- MINIMALLY INVASIVE TECHNIQUE, USING 8 GAUGE TREPHINE NEEDLE FOR BONE DOWEL EXTRACTION.
- MAY BE COMBINED WITH ALLOGENIC, AUTOLOGOUS OR SYNTHETIC BONE CHIPS HYDRATED WITH MARROW ASPIRATE.



MC-RAN-8C Components (from left): Marrow Cellution Introducer Needle, Aspiration Cannula, Blunt Stylet, 8 Gauge Trephine Needle, Extraction Tool, Measurement Probe, Tip Guard

## INTACT BONE DOWELS VS. MORSELIZED BONE

Harvesting an intact cancellous bone dowel which does not disrupt the highly-organized living tissue of the bone is different from transplanting pieces of bone. Such grafts that maintain the micro-vascular within the graft do not show extensive resorption, callus formation or remodeling.<sup>(1,2)</sup> The inherent difference is based on the ability of intact bone to exploit the biology of normal fracture healing rather than through creeping substitution that is fundamental to the incorporation of a non-vascularized graft.<sup>(1)</sup> Research demonstrates the enhanced survival of a free bone graft as long as its primary blood supply is preserved or re-constituted. A living bone graft will shorten the time for bony union because the reconstructed bone is comparable to a bone with a double fracture.<sup>(1,2)</sup> **Allogenic or synthetic bone chips hydrated with marrow can be packed around the living bone graft/dowel to accelerate anastomosis into the graft and minimize the amount of morbidity.**<sup>(1,2)</sup>

## MINIMALLY INVASIVE COMBINATION BONE GRAFTS

Vascularized and cancellous autograft show optimal skeletal incorporation but are limited by morbidity concerns.<sup>(3)</sup> Using the Marrow Cellution™ graft delivery syringe and the Marrow Cellution™ Bone Dowel Harvest device, the clinician can create a combination graft of a vascularized intact bone dowel in the center of the graft surrounded by allogeneic, autologous or synthetic bone chips hydrated with high cellular marrow aspirate. **Higher quality, less quantity, delivered appropriately minimizes host morbidity.**

### Sources:

- 1) Bleuming SA, He XC, Kodach LL, Hardwick JC, Koopman FA, Ten Kate FJ, van Deventer SJ, Hommes DW, Peppelenbosch MP, Offerhaus GJ, Li L, van den Brink GR (Sep 2007). "Bone morphogenetic protein signaling suppresses tumorigenesis at gastric epithelial transition zones in mice". *Cancer Research*. 67 (17): 8149-55.
- 2) Ostrup et al Distant transfer of a free, living bone graft by micro-vascular anastomoses. An experimental study. *Plast Reconstr. Surg.* 1974 Sep; 54(3): 274-85.
- 3) Taylor G The Free Vascularized Bone Graft: A Clinical Extension of Microvascular Techniques *Plastic & Reconstructive Surgery* May 1975 volume 55 Issue 5 ppg 533-544.

## PRODUCT DETAILS

### FOR BONE MARROW ASPIRATE

Catalog #	Part #	Description
MC-RAN-13C	74291-01M	13 Gauge x 3.5" Introducer Needle 13 Gauge Blunt Stylet 17 Gauge Aspiration Cannula 10 mL Syringe
MC-RAN-13CSTS	74291-02M	13 Gauge x 4.5" Introducer Needle 13 Gauge Blunt Stylet 17 Gauge Aspiration Cannula 10 mL Syringe
MC-RAN-11C	74219-06M	11 Gauge x 3.5" Introducer Needle 11 Gauge Blunt Stylet 14 Gauge Aspiration Cannula 10 mL Syringe
MC-RAN-11CSTS	74219-07M	11 Gauge x 4.5" Introducer Needle 11 Gauge Blunt Stylet 14 Gauge Aspiration Cannula 10 mL Syringe

### FOR BONE MARROW ASPIRATE + PERCUTANEOUS CANCELLOUS BONE HARVESTING

Catalog #	Part #	Description
MC-RAN-13A	74293-01M	Includes all MC-RAN-13C components 8 Gauge x 4" Swaged Tip Introducer Needle Measurement Probe Cancellous Bone Dowel Extraction Needle
MC-RAN-13ASTS	74293-02M	Includes all MC-RAN-13CSTS components 8 Gauge x 6" Swaged Tip Introducer Needle Measurement Probe Cancellous Bone Dowel Extraction Tool
MC-RAN-8C	74266-01M	Includes all MC-RAN-11C components 8 Gauge x 4" Swaged Tip Introducer Needle Measurement Probe Cancellous Bone Dowel Extraction Tool
MC-RAN-8CSTS	74266-04M	Includes all MC-RAN-11CSTS components 8 Gauge x 6" Swaged Tip Introducer Needle Measurement Probe Cancellous Bone Extraction Tool

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USA & Foreign Patent(s) Pending

ISO 13485:2003