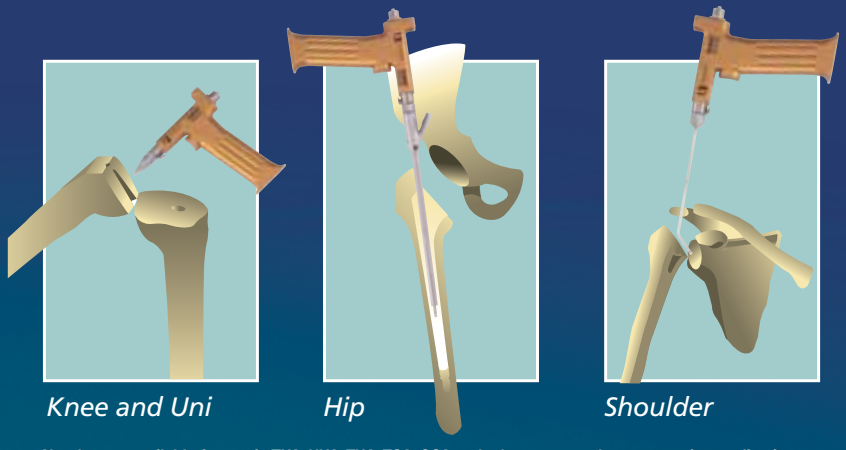
CarboJet®

CO_2 Bone Preparation System

A Better Way to Clean Bone

- Increase Cement Penetration[1,2]
- Increase Bone-Cement Interface Strength[3]
- Reduce Opportunity for Micro-Emboli[4]
- Essential for Tourniquetless TKA[5,11]
- Reduce OR Time and Cost[6]

*A **clinically proven** system that removes lipids/marrow elements and fluids from the cement interface to improve cement penetration and bond strength.*



Nozzles are available for use in TKA, UKA, THA, TSA, OCA and other cemented reconstructive applications.

KINAMED® INCORPORATED

Quality Care. Clinically Proven.

The *Gold* Standard for Cement Bed Preparation

CarboJet CO_2 Bone Preparation System

Concerned About Loosening?

Aseptic loosening is now recognized as the predominant failure mode in primary knee arthroplasty.[7,8] A recent study[7] of 938 primary knees found that aseptic loosening was the most common mechanism of failure, accounting for 28% of all failures. In UKA, aseptic loosening accounted for more than 60% of failures.[7] These data underscore the importance of achieving optimal cement fixation via meticulous cleaning and drying of the bone bed.

A Simple Solution

CarboJet's CO_2 gas jet quickly and thoroughly cleans and dries the bone bed by bringing blood, saline and, most importantly, lipids/fatty marrow elements to the surface where they are easily collected and removed. Cleaning and drying with CarboJet takes no more time than is typically required for drying with lap sponges. The superior cleaning achieved with CarboJet improves cement penetration depth[1,2] thus offering the potential for a reduction in bone-cement interface stress[9] and increased cement mantle toughness.[10] Increased bone-cement interface strength is the result.[3]

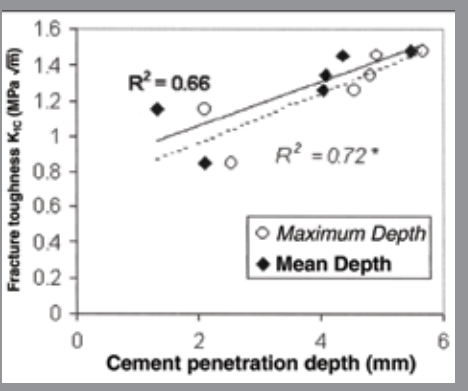
Saline lavage removes gross debris, but fluid remaining in the interstices of bone prevents thorough cleaning.

A compressed gas jet displaces fluid and fluid-suspended debris, thereby cleaning and drying porous structures.

Clinically Proven

CarboJet has been proven to be safe and effective in multiple clinical studies and in tens of thousands of joint reconstructions. Discover why so many surgeons are making CarboJet a standard part of their cement technique.

Cement mantle toughness correlates with cement penetration depth.[10]

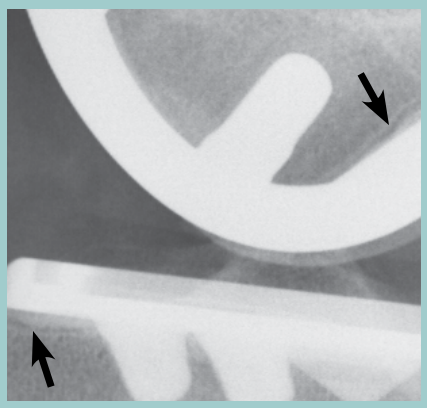


Bone-cement interface strength is 58% higher with CarboJet cleaning versus saline lavage.[3]

1. Goldstein (2007) **Improvement of cement mantle thickness with pressurized carbon dioxide lavage.** ISTA. Paris, France.
2. Woodgate (2008) **A radiological comparison of cement mantle thickness around TKA.....**Australian Orthopaedic Association.
3. Ravenscroft, Stanley et al (2010) **Bone-Cement Interface Strength in Distal Radii Using Two.....**Hand Surgery 15(2):95-98.
4. Lassiter, Bolognesi et al (2010) **Intraoperative embolic events during TKA with use of pulsatile.....**ORS. New Orleans, USA.
5. Jones (2011) **Total Knee Arthroplasty without the use of a tourniquet.** Seminars in Arthroplasty 22:176-178.
6. Stiehl (2014) **Mechanical Performance of a Self-Unplugging Surgical Suction.....**Reconstructive Review 4(1):18-22.
7. Berend, Lombardi, Barnes, Bolognesi, Ritter et al (2013) **Mechanism of Primary Knee Arthroplasty.....**AAOS.
8. Lewold et al (1998) **Revision of unicompartmental knee arthroplasty: outcome in.....**Acta Orthop Scand.69(5):469-74.
9. Thompson et al (2010) **The Importance of a Good Cement Mantle with an All-Poly Inlay UKA.** ORS. New Orleans, USA.
10. Graham et al (2003) **Effect of Bone Porosity on the Mechanical Integrity.....**J Bone Joint Surg Am. 85:1901-1908.
11. Meneghini (2018) **Tourniquetless TKA...Decreases Pain and Opioid Consumption in Females**.....AAOS. New Orleans, USA.

Improved Cement Mantle

CarboJet enables cleaning and drying of posterior aspects of tibial and femoral surfaces.



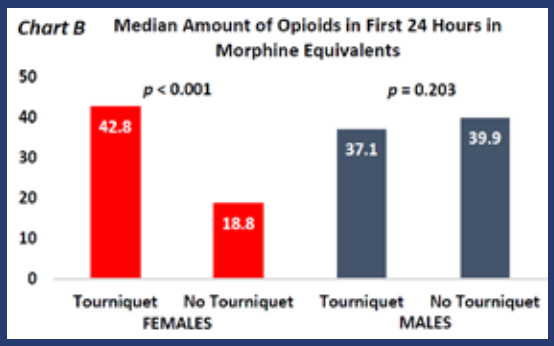
Bone bed prepared with pulsatile saline lavage. Arrows indicate radiolucent lines.

Bone bed prepared with syringe saline lavage and CarboJet CO_2 Bone Preparation System.

Essential for Tourniquetless TKA

Tourniquetless Total Knee Arthroplasty with Modern Perioperative Protocols Decreases Pain and Opioid Consumption in Females

A recent study,[11] presented at AAOS 2018 by R. Michael Meneghini, M.D., demonstrates reduced opioid consumption in female patients when a tourniquet was not used in total knee arthroplasty (TKA). CarboJet was used to maximize cement interdigitation – an essential component of the tourniquetless TKA technique. The ability to reduce opioid consumption using this technique is significant, since opioid addiction has become a national crisis, and protocols that result in reduced patient pain are being sought.



Scan for Video of CarboJet in Tourniquetless TKA:

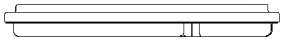
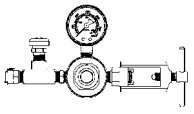
B/C FPO.

Do NOT print red dieline.

CarboJet CO_2 Bone Preparation System

25-100-2001	Carbojet CO_2 Tubeset, Sterile Packed (each)	

Standard Instruments

25-200-0200	CarboJet Handpiece	
25-200-0220	CarboJet Angled Tip Nozzle (peg holes, shoulder)	
25-200-0230	CarboJet Wide-Angle Nozzle (knee)	
25-200-0242	CarboJet Femoral Canal Suction Tube (12mm dia.)	
25-200-0244	CarboJet Femoral Canal CO_2 Nozzle	
25-200-0246	CarboJet 40 Degree Nozzle (knee, glenoid)	
25-200-0300	CarboJet Sterilization Tray	
25-200-0110	CarboJet Pressure Regulator (with CGA 940 pin-index yoke tank connection)	

Surgeon Testimonials

"I use it on Uni Knees. We often get a lot of bone bleeding – even with a tourniquet during cementation. The CarboJet dries the bone superbly for implantation. Outstanding addition to my surgical technique!!"
Airell Nygaard, MD, Yosemite Joint Replacement, Sonora, CA, USA

"CarboJet provides my patients with a much cleaner, drier bone bed allowing for better cement penetration and hence a better mechanical interface between bone and implant for secure long-term fixation."
Richard "Dickey" Jones, MD, Dallas, TX, USA

"I have made gas jet lavage with CarboJet the critical last step in bone preparation in all my cemented arthroplasty cases. The removal of additional marrow elements that could otherwise form embolic debris during cement pressurization is important to patient safety."
H.M. "Mac" Reynolds, MD, Oakland, CA, USA, In Memoriam

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CE 0086

Caution: Federal law restricts this device to sale by or on the order of a physician. Prior to use of a Kinamed device, please review the instructions for use and surgical technique for a complete listing of indications, contraindications, warnings, precautions, and directions for use. CarboJet® U.S. Patent No. 8,100,851; 8,721,595. Japan Patent No. 5,735,524. Additional US & International Patents Pending.

UKA x-rays courtesy of Dennis McGee MD, Boise, ID, USA.

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