

"With over 3000 procedures and not a single complication, HemaClear may be superior to traditional tourniquets in terms of the pressure."

Peter F. Sharky, MD

HemaClear: Testimonial by Dr. Sharky on Why HemaClear is Effective

"HemaClear lasts a long time during surgery and gives me a better predictability and more exposure when I work around the elbow."

Jessie B. Jupiter, MD

HemaClear: Dr. Jupiter & His Experience with Using HemaClear for Elbow Surgeries

"The more you use it, the more you get used to it. It's so quick just to put on and it's always sterile. We use HemaClear for all cases."

John Herzenberg, MD

HemaClear: Testimonial by Dr. Herzenberg on using HemaClear for Pediatric Procedures -

"It is very easy to use. You just put it on and it's done. I think it's a very good option to use for operations."

Doron Norman, MD

Orthopedic Trauma - Dr Norman Testimonial about HemaClear

HemaClear®

Sterile & Bloodless Surgical Field



Value

Patient-benefits of HemaClear overcome the adverse effects and risks of pneumatic tourniquet.

Surgeon-benefits: Excellent exposure and very dry field; Longer hamstring autograft for ACL reconstruction.

OR Staff-benefits: Predictable: never slides down towards the incision; easy and quick to apply, no pressure loss and re-do of drapes.

Procurement and Logistics benefits: No clutter and shorter preparation time, less shelf space; replaces cuff, Esmarch, stockinet, padding, pump and tubing extensions. Competitive cost.

Application

Selection: HemaClear Model is selected by using the color-coded ruler supplied with each unit.

Placement: Position on fingers/toes and pull handles along the limb (Testimonial HemaClear® Mr. Rhidian Morgan-Jones FRCS (Tr. Orth), Cardiff, Wales - Bing video).

Removal: HemaClear ring is cut by scalpel after inserting the Protective Card. Stockinet is cut by scissors.

Determine pressure: Measure circumference and distance from fingers/toes. Use look-up table for pressure.

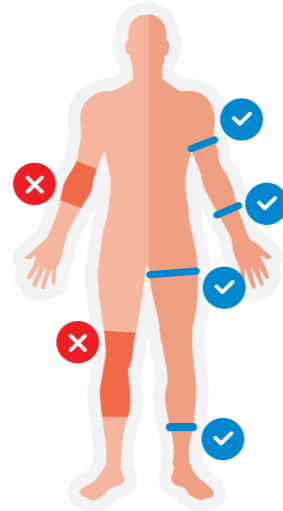
Temporary release: Insert and pull two Army-Navy retractors.

HemaClear® Models, Uses and Ordering Information

Model	Catalog #	Units /Case	Circumference of Limb cm	Max. BP mm Hg	Common Uses/ Placement
SMALL Pink	PRH-028-PI-01A	10	14-28	130	Pediatric Ortho
MEDIUM Yellow	PRH-040-YE-01A	10	24-40	190	Adult Upper Arm
MEDIUM Red	PRH-040-RE-01A	10	24-40	160	Adult Upper Arm
MEDIUM Green	PRH-040-GR-01A	10	24-40	130	Pediatric Ortho
LARGE Brown	PRH-060-BR-01A	10	30-55	190	Adult upper thigh
LARGE Orange	PRH-060-OR-01A	10	30-55	160	Adult Ankle, Arm
LARGE Blue	PRH-060-BL-01A	10	30-55	130	Pediatric thigh
XLARGE B & W	PRH-090-BW-01A	10	50-85	160	TKA upper thigh
Model A – Ankle	PRH-032-MA-01A	12	22-32	160	Foot Surgery
Model F – Forearm	PRH-035-FA-01A	25	14-35	160	Hand Surgery

Max BP – Maximal Blood Pressure (Systolic); B & W – Black and White; Ankle – for Ankle placement; Forearm – for Forearm placement. HemaClear is supplied in cases.

Size selection is by color-coded measuring tape supplied with each HemaClear® Unit.



Placement diagram
Place where there is minimal muscle to avoid tourniquet pain:

- 10 cm above wrist;
- Between deltoid and biceps;
- 10 cm above ankle; and
- As high as possible on groin.

Never place directly on elbow or knee.

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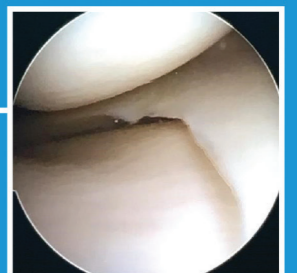
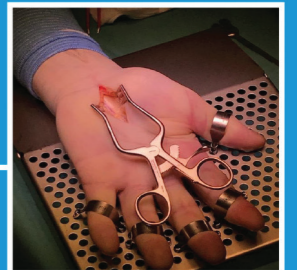
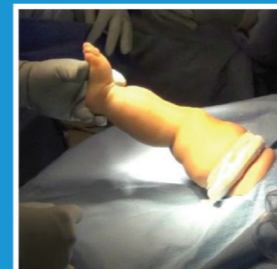
The All-In-One, Sterile, Exsanguination Tourniquet

Improving Patient Safety

Saving Time and Clutter in the Operating Theater

"The HemaClear technique is unparalleled"

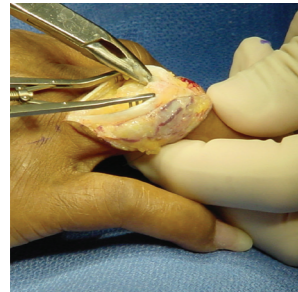
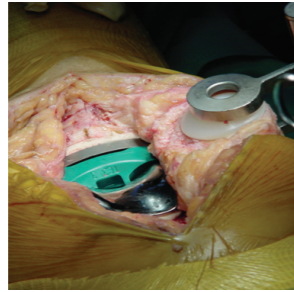
Dr. David Helfet Chief of Orthopedic Trauma
Hospital for Special Surgery, New York



Sterile Bloodless Surgical Field in Limb Surgery

Dry Surgical Field

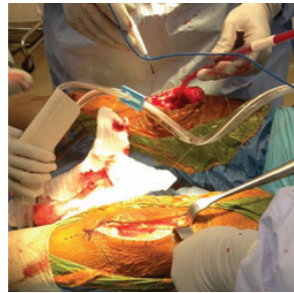
No Blood
HemaClear® Exsanguinates 95% of the blood to provide a dry field and optimal visibility. Image on Right shows TKA.



PIP joint replacement

Simultaneous bilateral TKA.

Left leg with HemaClear. Right leg with pneumatic cuff; Note bleeding and the use of cautery, suction and pulse lavage in Right leg.



Less Surgical Site Infection (SSI)

HemaClear® is always sterile.

Its ring is cut at the end of surgery and can never be re-used. HemaClear does not require handling, cleaning or soaking at the end of surgery, not exposing the OR personnel to contamination risk.



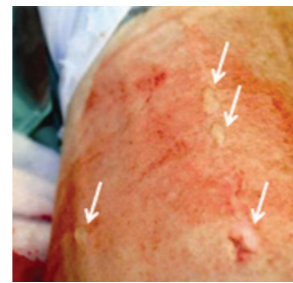
Image on right-top shows an SSI of a knee post TKA and on bottom the placement of non-sterile pneumatic cuff on a limb. **ALL** non-sterile cuffs are contaminated. **Evidence: see list of references below.**



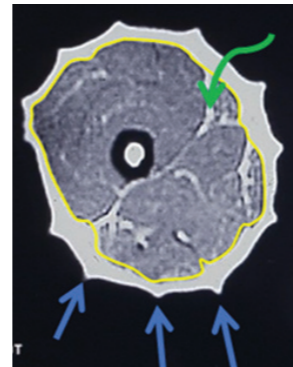
No Skin Injury

HemaClear does not cause skin injury.

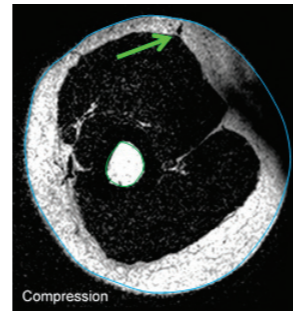
Pneumatic Tourniquets cause blisters in 20.7% of TKA patients. Skin injury with blisters is seen in top photograph; white arrows point to blisters.



The linear skin folds are caused by pinching of the skin by the inflated tourniquet (Blue arrows) in the MRI of thigh (Right) with pneumatic tourniquet; Estebe, Le Garrot Pneumatique February 2016 **Le Praticien en Anesthésie Réanimation 20(1)**



Bottom image: MRI with HemaClear® placed on Left thigh. Green arrow points to blood vessel. Note the smooth perimeter of skin contact of the HemaClear.



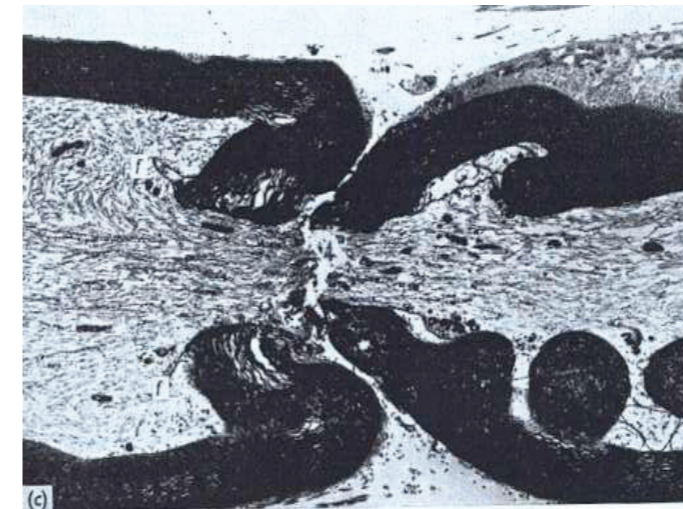
No Nerve Injury

In over 1,500,000 cases performed with HemaClear®, no nerve injury was reported.

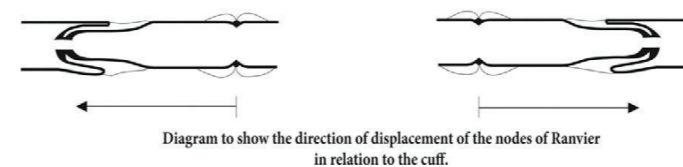
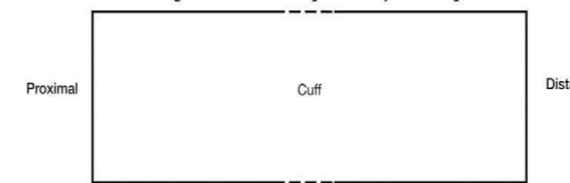
The incidence of Pneumatic Tourniquet nerve injury is varying from 1:4000 in general to 7.7% in procedures lasting more than 2 hours, Mayo Clinic. **Tourniquet-Related Iatrogenic Femoral Nerve Palsy after Knee Surgery: Case Report and Review of the Literature (hindawi.com);**

Anesthetic, Patient, and Surgical Risk Factors for Neurologi... : Anesthesia & Analgesia (lww.com)

The mechanism of pneumatic-tourniquet-induced nerve damage was revealed by Ochoa et Al (Ochoa J, Fowler TJ, and Gilliatt RW. Anatomical changes in peripheral nerves compressed by a pneumatic tourniquet. *J Anat* (1972), 113, 3, 433-455.) who found that the nerves compressed under the tourniquet elongated and telescoped into themselves (picture) at the Nodes of Ranvier where the nerve is weaker. Axonal disruption is clearly seen in the electron microscopy image.



Changes in nerves compressed by tourniquet



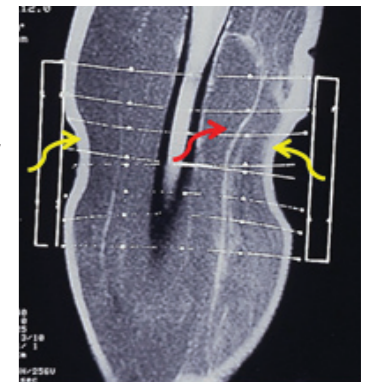
The telescoping was found only at the two edges of the cuff and was directly attributed to its width. Another mechanism described by Ochoa et Al is related to the steep pressure gradient at the ends of the cuff, causing shearing force on the nerves. **Both mechanisms do not exist with the HemaClear.**

Less Pain

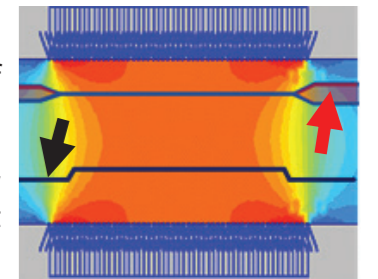
Intra-operative and post-operative tourniquet pain is common (40%) with pneumatic tourniquet.

Multiple independent peer-reviewed clinical studies have shown that Tourniquet pain is significantly reduced when HemaClear® is used. What is the mechanism of wide-tourniquet tourniquet pain and how is it mitigated by the narrow HemaClear®?

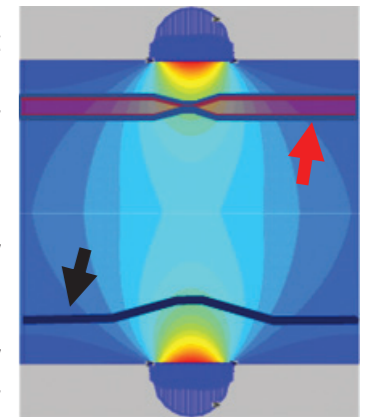
This MRI of a thigh with pneumatic tourniquet clearly shows the source of the pain: the deformation and stretching of the fascia (red arrow), where the C-fibers that conduct pain to the spinal cord reside. It is like a circumferential "Charlie Horse".



The diagrams on the right are from Eyal Levenberg's finite element analysis of stresses & strains in a limb beneath a wide (top) and a narrow (bottom) tourniquets. It helps understand the biomechanics and the safety of HemaClear.



The pressure distribution beneath a pneumatic tourniquet is uniform and as high as the tourniquet pressure all over. The surface (skin) pressure beneath a HemaClear is essentially the same as under a pneumatic tourniquet, but dissipates radially due to the elastic properties of the tissues.



The result is that the overall pressures applied by a wide pneumatic tourniquet on the artery (red arrows) and the nerve (black arrows) are higher, extend over a much longer distance and the gradients are much more abrupt and steep.

References Journal of Arthroplasty, 2013. Nondrainage Decreases Blood Transfusion Need and Infection Rate in Bilateral TKA. Demirkale, et al. "Significantly fewer patients reported pain in the thigh..."

JHS(E), 2010 Pain and paraesthesia produced by silicone ring and pneumatic tourniquets. "...significantly lower pain score"

Microbial Colonization of Tourniquets Used in Orthopedic Surgery By Eric F. Walsh, MD; Debby Ben-David, MD; Mark Ritter, MD; Anthony P. Mechrefe, MD; Leonard A. Mermel, DO, ScM; Christopher W. DiGiovanni, MD **ORTHOPEDICS 2006; 29:709.**

A Study of Microbial Colonization of Orthopedics Tourniquets SMY Ahmed, R Ahmad, R Case, and RF Spencer **Ann R Coll Surg Engl. 2009 Mar; 91(2): 131-134.**

Microbial Colonization of Pneumatic Tourniquets in the Orthopedic Operating Room Syed H. Mufarrih, Nada Q. Qureshi, Rizwan H. Rashid, Bilal Ahmed, Seema Irfan, Akbar J. Zubairi, Shahryar Noordin **8/2019 Cureus 11(8): e5308**

The effect of sterile versus non-sterile tourniquets on microbiological colonization in lower limb surgery SM Thompson, M Middleton, M Farook, A Cameron-Smith, S Bone, A Hassan **THEATRE TECHNIQUES Ann R Coll Surg Engl 2011; 93: 589-590.**