Misonix Bonescalpel™
Economic Value Proposition

About Misonix

New York based medical device company
listed on NASDAQ (MSON)

Innovative leader in
Ultrasonic & Tissue-Specific Surgical Devices

- Ultrasonic
  - Misonix BoneScalpel™
    - Hard Tissue removal via
      Ultrasonic Bone Dissection & Ablation
The advent of ultrasonic bone dissection is as significant to spine surgery today as the adoption of pneumatic drill was several decades ago.”

“Power drills liberated spine surgeons from the slow, repetitive, fatigue inducing, and occasionally dangerous maneuvers that are characteristic of manually operated rongeurs.

Now ultrasonic dissection with BoneScalpel empowers the surgeon to cut bone with an accuracy and safety that surpasses that of the power drill.”

Dr. Peyman Pakzaban
Houston MicroNeurosurgery

The BoneScalpel Difference

- High Precision Osteotomy
- Soft Tissue Sparing
- Reduced Bleeding
- Minimal Bone Loss
- Time Savings
BoneScalpel’s Tissue Selectivity

The ultrasonic BoneScalpel efficiently cuts bone & mineralized/calcified structures while preserving delicate soft tissue structure that are elastic, such as the thin membrane of a raw egg.

Hospital Challenges in Spine Surgery

We recognize that there are major challenges in spine surgery today:

1. Blood loss

2. Blood transfusion
   - Allogeneic blood products
   - Autotransfusion with cell savers

3. Dural tears (ID)

4. Operative time

5. Surgical site infections (SSI)
Misonix BoneScalpel
Ultrasonic Osteotome
enhances your hospital’s

Competitive Advantage

by supporting surgical safety, better outcomes
and a better cost structure
in your spine surgery program

Hospital Challenge: Blood Loss

- **Blood loss in adult spinal surgery**
  - EBL ranges from < 0.5 to 3 L for common fusions (posterior / anterior), 30% require blood transfusions
  - EBL is substantial in major spine surgeries for
    - spinal stenosis, spondylolisthesis, adolescent idiopathic scoliosis,
    - spine trauma and spine tumors

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Average EBL</th>
<th>EBL Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-instrumented lumbar fusion</td>
<td>800 ml</td>
<td>100 - 3,100 ml</td>
</tr>
<tr>
<td>Instrumented lumbar fusion</td>
<td>1,517 ml</td>
<td>360 - 7,000 ml</td>
</tr>
<tr>
<td>Combined anterior &amp; posterior fusion</td>
<td>3,556 ml</td>
<td></td>
</tr>
<tr>
<td>Adult deformity</td>
<td>&lt;1,000 ml</td>
<td>2,000 - 3,000 ml</td>
</tr>
<tr>
<td>Adult deformity, revision of prior fusion</td>
<td>325 – 4,700 ml</td>
<td></td>
</tr>
<tr>
<td>Vertebral osteotomies</td>
<td>≤4,700 ml</td>
<td></td>
</tr>
<tr>
<td>Tumor decompression w. instrumentation</td>
<td>1,500 ml</td>
<td></td>
</tr>
</tbody>
</table>

- **Greater blood loss means**
greater fluid shifts / more transfusion / exposure to more blood products /
higher risk of disease transmission, e.g. variant Creutzfeld-Jacob disease (vCJD) /
higher risk of adverse reactions, e.g. transfusion-related acute lung injury (TRALI) /
prolonged stay in the ICU

Using BoneScalpel in multi-level fusions Bartley et al. [2] demonstrated that:
- Blood loss was reduced by 38% against control A (Cobb matched) and by 31% against control B (most recent cases prior using BoneScalpel).

Hospital Challenge: Blood Transfusion

- **Allogeneic blood products**
  - Risk of transmissible diseases, e.g. hepatitis B, hepatitis C, AIDS/HIV, West Nile virus (WNV)
  - Risk of transmitted bacterial infection
  - Risk of transfusion related acute lung injury (TRALI)
  - Risk of perioperative myocardial infarction and postoperative low-output cardiac failure
  - Higher mortality
  - Rejection for religious reasons, e.g. Jehovah's Witnesses

- **Autotransfusion with cell savers**
  - Gaining popularity to reduce need for allogeneic blood transfusions and associated complications
  - Excepted by some of Jehovah's Witnesses for intraoperative use
  - Adjunct to allogeneic blood transfusion, not replacement
  - Contraindicated with blood clotting agents and hematological disorders
  - Extensive preparation, actual use is cases-by-case decision
    → Only used in 32% of spinal surgeries where cell salvages was prepared for stand-by

BoneScalpel Reduces Transfusion with Cell Savers

Using BoneScalpel in multi-level fusions Bartley et al. [2] demonstrated that:
- Cell savers transfused were reduced by 53% over control A (Cobb matched) and 49% over control B (most recent cases prior using BoneScalpel).

Blood Management equals Cost Management

The use of blood transfusion and cell salvage comes at an additional cost to the hospital – the sum of direct acquisition costs plus overhead charges for processing and logistics.

Most commonly used blood products in spine surgery are red blood cells at an average cost of $909.46 per patient and cell salvaged blood at $1,736 per patient.

<table>
<thead>
<tr>
<th>Blood Product Used</th>
<th>Cost per Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red blood cells</td>
<td>$909.46</td>
</tr>
<tr>
<td>Whole blood</td>
<td>$312.24</td>
</tr>
<tr>
<td>Fresh frozen plasma</td>
<td>$2,550.41</td>
</tr>
<tr>
<td>Platelets</td>
<td>$2,467.89</td>
</tr>
<tr>
<td>Cryoprecipitate (frozen plasma)</td>
<td>$1,571.05</td>
</tr>
</tbody>
</table>

** Average cost calculated from cost of autologous transfusion, setting up the cell salvager recovery system and infusing autologous blood through the cell salvager

** Allogeneic plus autologous


BoneScalpel Reduces Blood Management Costs

- Blood management is of major importance for patient safety and hospital economics.
- Most commonly used blood products in spine surgery are:
  - red blood cells at an average per patient cost of $909.46
  - and cell salvaged blood at $1,736.00.
- BoneScalpel reduces blood loss up to 31-38% and cell savers transfused up to 49-53% in multi-level spinal fusions.
- Ultrasonic bone cutting with BoneScalpel is blood conserving and reduces blood management costs during spinal surgery.

Hospital Challenge: Dural Tears

- Incidental durotomies (ID)
  - Risk ranges from 1% to 17% in spine surgery
  - Risk increases in thoracolumbar vs cervical cases / revisions and with residency status
  - Incidental durotomies add to length of stay: + 1.07-1.09 days
  - IDs add to medical cost: + $28.834 for anterior
  - + $29.153 for posterior surgeries
  - IDs add to litigation risk:
    - ID has second highest occurrence in malpractice cases for lumbar surgery
    - Laminectomy (incl. fusion) has highest litigation payouts with $320k-$390k on average
    - Risk for lawsuits is 1 in 3 years for every orthopedic surgeon, for neurosurgeons 1 in 2 years
    - 99% of lawsuits are settled → Average legal cost is $35,000
    - 1% of cases with verdict → $367,000 average jury reward

William Barrick, Risk management for spine specialists. SpineLine July/August 2008
BoneScalpel Reduces Risks

“The incidence of durotomy has dropped with our BoneScalpel use to rare occasions at this point.”

Dr. Eric Woodard
New England Baptist Hospital, Boston, MA
after experience in 1,000 cases

▶ A reduction of 1 incidental durotomy per year could save you $29,000 annually.
(based on added medical cost for treatment of ID)

BoneScalpel Reduces Operative Times (i)

“This was a previous fusion.
What would have taken me 45-60 min per level was completed in less than 10 min per level using the BoneScalpel Ultrasonic Osteotome.”

“I am now able to complete bilateral facetectomies from T2/3 to T11/12 in less than 15 minutes.”

“What once required 1 hour of meticulous decompression with mechanical tools of compromised spinal nerves can now be accomplished in less than 15 minutes and I am now routinely scheduling shorter operative times for my multi-level decompressions.”

Dr. Isador Lieberman
Texas Back Institute, Plano, TX
BoneScalpel Reduces Operative Times (ii)

“With an osteotomy, we used to assess whether to do ONE, TWO or even THREE with a complex deformity. It gives you pause when you know that each osteotomy is going to add 20 to 30 or even 40 minutes of operative time, as well as the increased blood loss and the increased potential risk.”

“But now with the BoneScalpel, we can finish in a matter of 2 minutes, essentially bloodlessly, and it significantly improves the ability to vary our approach in a controlled fashion to achieve and perform a correction.”

Dr. Eric Woodard
New England Baptist Hospital, Boston, MA
after experience in 1,000 cases

“The BoneScalpel certainly has made bone resection easier and quicker.”

Dr. Nicholas Theodore
Barrow Neurosurgical Associates, Phoenix, AZ

Hospital Challenge: Infections

Surgical site infections (SSI)
- Risk ranges from 0.7-12% in all spine surgery, 0.5-1.6% in adolescent idiopathic scoliosis with up to 22% in high-risk patients
- Risk increases with blood loss / blood transfusion / operating time / revisions / previous infections / high-risk patients
- SSI are one of the most common causes of morbidity and mortality
- Risk of implant removal after SSI can be as high as 20.9%
- 80.4% of re-admissions for SSI in spine surgery occur within the 30-day period

→ hospital assumes cost burden under episode-of-care mode

BoneScalpel Contributes to Fewer Infections

- Blood loss, blood transfusion and operative time are known risk factors for SSI. Their reduction should result in a lower risk for SSI.
- BoneScalpel has been reported to significantly reduce blood loss and transfusion with cell savers in multi-level fusions.
- BoneScalpel has been reported by leading KOLs to reduce operative time and O.R. block time.
- BoneScalpel thus contributes to reducing the risk of surgical site infections (SSI).

Summary Cost Effectiveness

“The general advantages of the BoneScalpel are numerous. We now use it essentially on every spine patient, and we have found in our practice that it significantly reduces operative time, decreases blood loss, and markedly increases the amount of residual local bone available for grafting. In so doing, it significantly reduces overall O.R. time and O.R. cost.”

Dr. Eric Woodard
New England Baptist Hospital, Boston, MA
after experience in 1,000 cases

Source: Medco Forum, Volume 19, Number 53, October 2012
U.S. Top Hospitals - Pediatrics

3 of the top 10 pediatric hospitals for orthopedics are BoneScalpel users

- Children's Hospital Los Angeles
  Los Angeles, CA
- Nemours / Alfred I. duPont Hospital for Children
  Wilmington, DE
- Rady Children's Hospital
  San Diego, CA

Top U.S. Hospitals

The following top hospitals are already BoneScalpel users:

- Cleveland Clinic / Lutheran Hospital
- Mayo Clinic Jacksonville
- Memorial Herman
- Methodist Hospital Houston
- Montefiori Medical Center
- New England Baptist Medical Center
- North Shore LIJ (Long Island Jewish)
- NY Presbyterian Hospital – Weill Cornell
- Penn Medicine
- Shriners Hospital Philadelphia
- SUNY Upstate Medical University
- Swedish Covenant Hospital
- Texas Back Institute
- The University of Texas MD Anderson Cancer Center
- Winthrop University Hospital
- Virginia Tech University Carilion Clinic
Will you work with us?