

# Special REPORT

## Integrating Surgical Rib Fixation Into Clinical Practice

*A Report From the Rib Fracture Consensus Meeting*

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In June 2013, DePuy Synthes hosted a Rib Fracture Consensus Meeting where national and international experts gathered to discuss the issues regarding surgical rib fixation and attempted to outline an effective approach to treatment. This monograph outlines the Consensus Meeting's findings, and provides expert commentary from some of the attendees as well as surgeons in clinical practice.

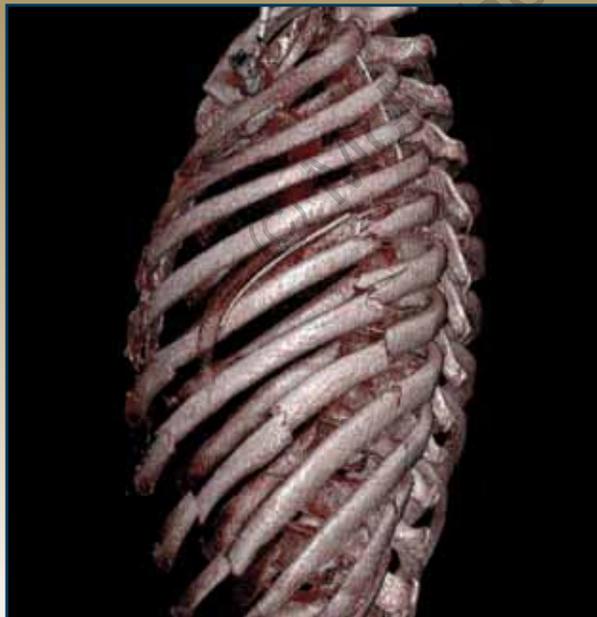
Note: This report contains descriptions of multiple patient cases. Results from case studies are not predictive of results in other cases. Results in other cases may vary.

**E**ach year in the United States, almost 200,000 people suffer rib fractures, often in conjunction with other injuries, as a result of blunt trauma (Figure 1).<sup>1-3</sup> Patients with rib fractures tend to be more severely injured than trauma patients without rib fractures, have a 50% higher risk for pneumonia, spend more time in the hospital with longer intervals in the ICU, and spend more time on a ventilator.<sup>4-6</sup> For the vast majority of these patients, however, treatment options for their rib fractures consists of little more than rest and pain relief.<sup>3</sup>

The relatively recent availability of fixation technology specifically tailored to rib fixation presents a potential option toward a more effective approach to managing rib fractures when compared with past surgical strategies. In the past decade, a small number of randomized trials have found that surgical rib stabilization of selected patients with flail chest resulted in reduced ventilator dependence, fewer days in the ICU, less pneumonia, better eventual pulmonary function, and faster return to work.<sup>6,7</sup> Despite the potential advantages of early surgical intervention, surgical rib fixation in the United States is just beginning to take hold.<sup>3</sup> Its acceptance will require a paradigm shift in a direction that is counterintuitive to medical evolution's shift toward fewer open procedures.

### Issues With Conventional Treatment

Over the past century, treatment of fractured ribs shifted from skeletal traction to "internal pneumatic stabilization"



**Figure 1.** CT scan of a rib fracture in a patient involved in an industrial rollover accident.

Courtesy of Adam M. Shiroff, MD

to today's standard of care, favoring analgesia and pulmonary hygiene, with surgical treatment considered as salvage therapy by a level 3 recommendation in cases of severe flail chest, according to the guidelines of the Eastern Association for the Surgery of Trauma.<sup>3,8</sup> Although a handful of centers around the world have been investigating the role of surgical treatment for the past 50 years,<sup>9</sup> a universal protocol has not been established in the United States; thus, treatment focuses only on underlying injuries and pain.

"The majority of patients with rib fractures today are managed the way they have been for the last 30 or 40 years," said Jose Diaz Jr, MD, CNS, FACS, FCCM, professor of surgery, University of Maryland School of Medicine, who also works for the university's Trauma Center.

For many of these patients, the delay in receiving more aggressive treatment may result in developing further complications, including pneumothorax and hemothorax.<sup>3,10</sup> "It is well known that the major immediate risk for rib fractures is a pneumothorax or hemothorax; later risks are pulmonary complications like pneumonia or respiratory insufficiency. The need for endotracheal intubation and mechanical ventilator support can result in prolonged mechanical ventilation and the potential need for tracheostomy," Dr. Diaz added. "That, of course, dovetails into the added risk for ventilator-associated pneumonia."

The standard treatment for these patients, whose injuries often are the result of car accidents, falls, and industrial accidents, is pain management administered intravenously or orally, or through the use of blocks such as individual rib blocks, paraspinal blocks, or epidurals.<sup>3</sup>

"The traditional paradigm assumes if you support the patients' other underlying injuries—their lung injuries or whatever injuries to the extremities they may have—and give them enough pain control, eventually the rib fractures will heal and they will be fine," said Mario Gasparri, MD, associate professor of cardiothoracic surgery, Medical College of Wisconsin, Milwaukee.

This approach decreases the risk for some complications, but may cause other challenges in managing affected patients. "You have to be in the hospital to be on IV narcotics, you have to be in the hospital to have epidurals, and there are limitations on how long you can have an epidural or paraspinal block," said Dr. Diaz. "An individual rib block is performed with long-lasting, local pain medication, but these have 7 to 14 hours of effectiveness at the most."

### Inconsistency in Defining a Flail Chest

Perhaps one of the most severe types of rib fracture is a flail chest injury, accounting for about 10% of patients with rib fractures.<sup>5</sup> Despite the extent of the injury, clinicians find it challenging to classify a flail chest. "The difficulty in defining flail chest is that it is now considered only as an anatomy problem. But we often operate on people because of physiology, not just anatomy," explained Adam M. Shiroff, MD, FACS, chief of trauma, Jersey Shore University Medical Center and assistant professor of surgery at Rutgers Robert Wood Johnson Medical School. "There can be patients with a flail chest as

defined by several ribs in sequence with 2 fractures who have minimal pain and may not have any respiratory compromise, whereas other patients with multiple fractures in a row not considered flail chest have an enormous amount of pain, have ventilator-dependent respiratory failure, and act the way you would expect a patient with classic flail chest to act.”

This inconsistency is problematic in a few ways, not the least of which is reimbursement—how can surgeons bill for a procedure not considered the standard of care? “If you define flail chest simply as an anatomy problem, you run the risk of excluding patients who would otherwise need the surgery, but physicians and hospitals may not be reimbursed for it,” said Dr. Shiroff.

### **Suboptimal Quality of Life**

The traditional paradigm of treating patients with rib fractures simply falls short in optimizing outcomes and overall well-being.<sup>11</sup> Studies have shown that 69% of patients with rib fractures experience long-term morbidity.<sup>5</sup> “When patients have flail chest or multiple ribs broken in multiple spots, a lot of people die, and those who survive often have long-term disability,” said Dr. Gasparri. “They may have chronic shortness of breath or chronic pain, and they may never return to work.”

In patients with flail chest after traumatic injury, 49% to 64% experience long-term chronic morbidity, such as chest wall deformities and pain, and 39% are unable to return to any type of work.<sup>12-14</sup> Timothy Pohlman, MD, FACS, director of trauma critical care at IUHealth Methodist Hospital in Indianapolis, confirmed these observations with a recent patient who passed the test of being able to breathe on his own and was sent home with painkillers. “When he returned 2 weeks later, still able to breathe, he couldn’t lie down on the examining table because of the pain. Nor could he work,” he said. “He was a mailman, so if [he] can’t deliver the mail, [he’s] out of a job. I think that’s the point. We can talk about [hospital] lengths of stay, and a little less time on the ICU floor, but the salient point is how fast can we get people back to work.”

### **Concerns Regarding Surgical Intervention**

The slow adoption of treating rib fracture patients more aggressively is understandable, especially for surgeons who have not been exposed to the latest technologies that have made strides in overcoming the problems associated with earlier surgical interventions, nor have they received the appropriate training to perform these procedures.

### **Misconceptions Regarding Technology**

Data from the 1970s showed that surgery resulted in as many complications and risks as nonintervention, explained Dr. Diaz.<sup>9</sup> “In the 1970s, we made big incisions, we had significant chest wall exposure, and all we had available was basically the surgical wire we used to close sternums. You would run the wire around a rib or several ribs to hold them in place, or you would try to sew the rib together, or run some type of K-wire or pin into the medulla of the rib,” he said. This approach failed to stabilize the rib adequately and left patients with a large incision and the potential complications associated with such incisions.<sup>9</sup>

Before the advent of plates designed specifically to stabilize ribs, Dr. Gasparri recalled using pretty much anything he could get his hands on to set these fractures. “Rib fixation isn’t necessarily new. People have been talking about rib stabilization since the 1970s, even the 1960s,” said Dr. Gasparri.

Prior to the availability of rib fixation systems, “we were using whatever we could find. I’ve used wires, various plates, and screws that were not meant for ribs. I think that was a big impediment [to surgical intervention],” he said. “When you don’t have a good tool, it’s hard to do a good job, and I think that’s why we haven’t had a ton of enthusiasm for rib stabilization for so long. Now that we have plates specifically indicated for rib fixation, it is not necessary to use devices that are not designed for the rib.”

### **Identifying Appropriate Patients for Surgery**

In recent years, there has been a shift toward rib stabilization in patients with more severe injuries and early surgical intervention, but there is some controversy in this approach because there is no evidence to support one approach over another, or proof of which patients are the ideal candidates for surgery.<sup>15</sup> Surgery is only a level 3 recommendation in patients with flail chest<sup>8</sup>; its role in severely injured patients not identified as having flail chest is even less defined.

The challenge is determining who should be undergoing surgery. “That’s what everyone is trying to sort out these days,” said Dr. Gasparri. “It’s clear that not every rib fracture or flail chest should be operated on. You can have rib fractures and have absolutely zero pain. [Such patients] have minimal pain or the pain is well controlled, and they’re moving around and breathing well. I can’t make someone who has no symptoms better with surgery.”

“On the other end of the spectrum, you have patients who can’t take a breath. If you don’t fix them, they’re going to die,” explained Dr. Gasparri. “But most patients are in the middle, and that’s where the controversy is and where we need to sort things out: Who benefits, who doesn’t, and what’s the time frame.”

### **Lack of Clinical Evidence**

One of the problems plaguing proponents of taking on a more aggressive approach to rib fractures is the lack of compelling evidence.<sup>8</sup> “I am firmly convinced that early operative fixation has improved not only [our] ability to get patients off the ventilator, out of the ICU, and out of the hospital, but functionally—when these patients come back 4 to 6 weeks later, after they heal—they’re phenomenally much improved,” said Lawrence Lottenberg, MD, FACS, associate professor of surgery and anesthesiology, University of Florida, College of Medicine, Gainesville. “But there has not been a large, multicenter study comparing operative fixation with nonoperative repair. There are some prospective randomized studies, but they had very small numbers in the patient groups and were not well powered.”

Few would argue that large randomized controlled trials (RCTs) are essential to legitimize any procedure or device in the minds of the scientific and medical communities, and that the evidence generated by these trials paves the way toward payor recognition and reimbursement. But there are numerous practical and philosophical challenges in any such trial. Such a trial would require many centers to enroll enough patients to power the trial sufficiently, and it would be quite expensive.<sup>9</sup>

In developing RCTs, randomizing patients to more aggressive treatment poses an ethical question. Dr. Pohlman said he came to surgical rib fixation rather late, after suffering rib fractures himself and experiencing unbearable pain firsthand. “If you had proposed randomizing me to operative or nonoperative repair, I would have called you unethical,” he said.

For any clinical trial to meet ethical standards, there has to be equipoise among the researchers, and that may not be possible in this situation. “If you want to have a good, prospective RCT, the researchers, surgeons in this case, have to lack bias. They can’t know which one is better,” said Dr. Gasparri. “But if you’ve done 1 or 2 or 10 or 100 of these, as most of us have, you’ve seen the benefits. I think surgeons who know how to do it wouldn’t randomize to not undergoing surgery, and [those surgeons] who are skeptical about operative rib fixation wouldn’t start the study because they don’t believe in it.”

Dr. Shiroff acknowledged that surgeons may hesitate to integrate rib fixation as protocol in the absence of RCTs validating the science. “On occasion, innovation outpaces academics,” he said. “[Surgeons] who don’t want to do rib fixation can hide behind the lack of an RCT, but if you look around the country, this is a procedure that some centers are doing and doing a lot of, and there’s a reason for that. I think it will only get more popular, but that acceptance will take longer than it should because of the issues surrounding a major scientific trial.”

### **Validating Surgical Intervention**

The most compelling argument for surgical intervention is that it significantly reduces patient pain, allowing patients to breathe normally, reduce the use of mechanical ventilation, minimize the time in the ICU, and return to work faster.<sup>6,9,11,15,16</sup>

“[These patients] go into the operating room broken, in pain. The way I explain it to their families, every time they take a breath, it’s like walking on a broken leg. Except you don’t *have* to walk, but you have to breathe. Every time they take a breath, those ribs move—they click, they rub. Rib fixation immediately takes that movement away,” explained Dr. Shiroff. “The day after surgery, people who couldn’t roll over even with an ICU nurse’s help, get out of bed and shake your hand.”

In addition to facilitating normal breathing, fixation re-establishes the architecture of the chest, allowing the muscles to move in a normal, functional way, particularly for patients who are on a ventilator because of mechanical problems with the lungs or chest wall.<sup>16</sup>

Studies also have shown surgical fixation to be cost-effective compared with conventional treatment.<sup>2,6</sup> A third argument in favor of surgical rib fixation is the potential economic effect associated with patients returning to work faster.<sup>6,9,11</sup> “This is probably the biggest, but least studied and talked about benefit of rib fixation—getting people back to work,” Dr. Shiroff said. “I’ve had 50 or 60 profound examples of getting people back to their business, being productive members of society, as opposed to ending up with long-term disability and on pain medication.”

Surgical intervention is supported further by the improvement in plating technology.<sup>15</sup> “The plates are titanium based and lower-profile than other plates used in the past. There is much more knowledge now about the anatomy of ribs in humans, and the plates have been worked at the industry level to be much more applicable to the human anatomy,” said Vicente H. Gracías, MD, FACS, medical director, trauma and surgical care at Robert Wood Johnson University Hospital and chief of trauma/surgical critical care and professor of surgery at Rutgers Robert Wood Johnson Medical School. “In the last 5 years or so, the technique of how to do rib plating has really taken off, and we are now able to marry the surgical technique to the industry technology and have created what we consider to be a very good procedure.”

### **Reaching a Consensus on Rib Fractures**

The goal of the Rib Fracture Consensus Meeting was to bring together experts in the field to compare clinical experience and to develop a national protocol in defining the severity of the fracture and determining when to use surgical rib fixation. “I think all of us who have done a lot of [rib fixations] have had parallel experiences, so I’m curious to see if we can reach a consensus. In some respects, we’re all just flying blind, but perhaps we have developed similar practice patterns or protocols,” said Dr. Gasparri.

### **Integrating a Treatment Protocol**

In the absence of a nationally accepted standard in treating patients with rib fractures, some institutions have created their own practice patterns or protocols for identifying which patients would benefit from surgery, when to perform surgery, and what type of care patients should receive if they don’t meet the criteria for surgical intervention.

“We evaluate any patient who has 3 or more rib fractures in a row,” said Dr. Shiroff. “This means monitoring how they are doing from a respiratory standpoint, and assessing [the patient’s] pain tolerance—how they’re doing when they get out of bed. Obviously, a patient who is on a ventilator is in a much higher risk category, but we consider anyone with 3 or more rib fractures for fixation if they meet the respiratory or pain criteria.”

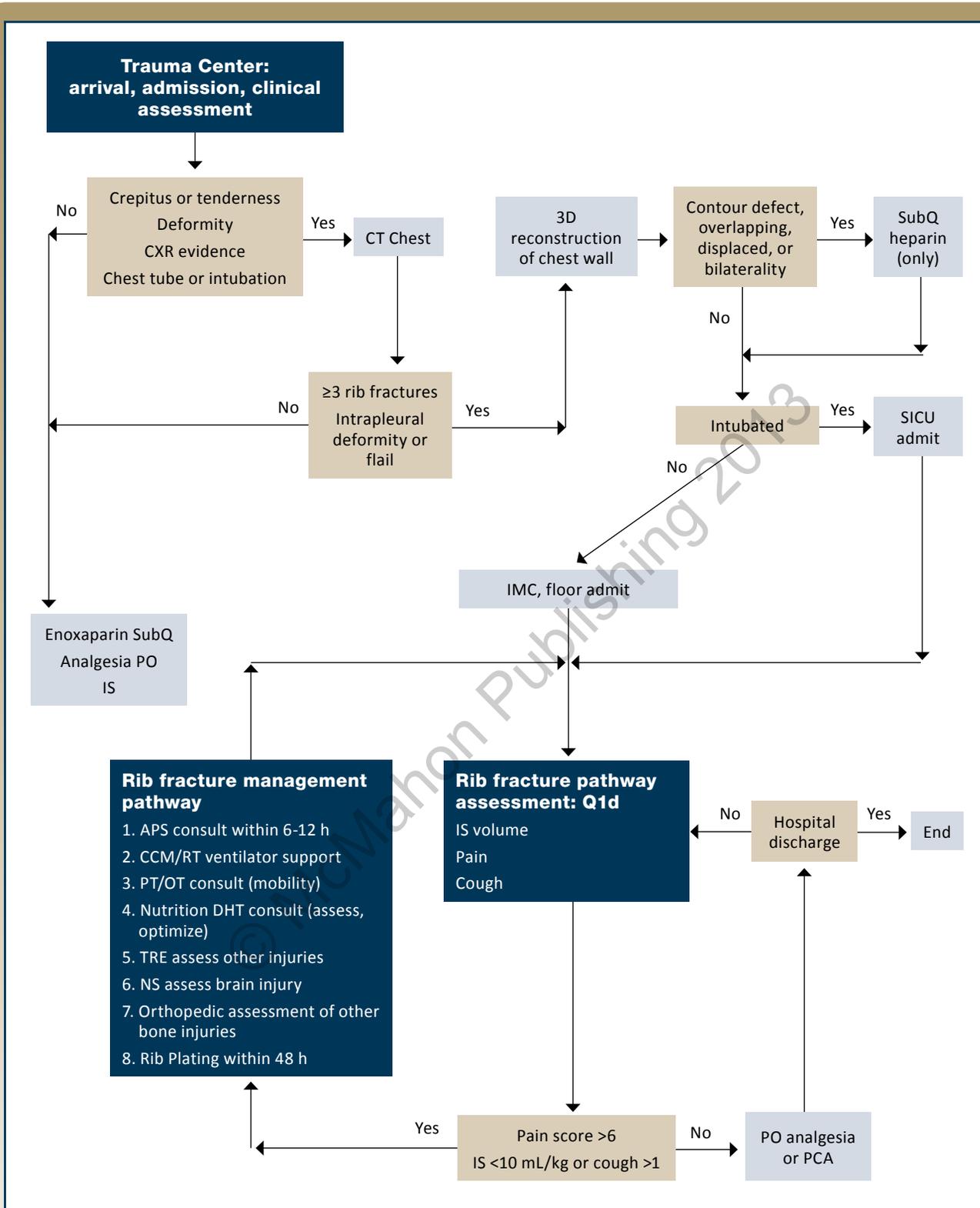
Dr. Gasparri first considers anatomic criteria—does the patient have 3 or more fractures with significant overlap or a flail component? Then he assesses for symptoms: “intractable pain: if, despite all the pain medicines, their pain is poorly controlled and you can see that they are not taking a deep breath,” he said.

When patients are already on a ventilator, some of these criteria can be difficult to assess. “Sometimes they have head injuries or other reasons [for being] on a ventilator,” explained Dr. Gasparri. “But I’ll still consider them for stabilization. I think it’s reasonable to proceed. This is anecdotal, but a lot of our rehabilitation team members have noted that patients who go through rib stabilization progress through rehab and recovery a lot faster than those who haven’t.”

Dr. Gracías and his colleagues have specific protocols for patient selection. “We see hundreds of patients a year with rib fractures, so we have a standard protocol in place. First, we use standard oral narcotics and IV narcotics to see if we can improve the overall respiratory function, using incentive spirometry as a guide.”

Patients who do well on pain management generally do not need surgery, noted Dr. Gracías; however, those who fail to advance despite heavy narcotic use are placed into more aggressive therapy with epidural and subcutaneous anesthesia. “We’ve learned that people with 4 or more rib fractures or with flail chest are the ones who may benefit from surgical fixation. If they don’t improve after aggressive narcotic and epidural use, we select them for an operation,” he said.

The more injured patients are, the quicker they tend to fail to respond to pain medicine, but on average Dr. Gracías and his colleagues identify surgery candidates within 72 hours. “Patients with very bad chest wall injuries are intubated right away, and these are the patients we tend to be very aggressive with early on because they’ve already failed,” he said. “But by 72 hours, we know which patients are going to do well on their own and which ones are failing and will need to be



**Figure 2.** The University of Florida algorithm on rib fracture management.

Courtesy of the Division of Acute Care Surgery, University of Florida College of Medicine

**APS**, acute pain service; **CXR**, chest x-ray; **CCM**, critical care medicine; **CT**, computed tomography; **DHT**, Dobhoff tube; **IMC**, intermediate care unit; **IS**, incentive spirometry; **NS**, neurosurgery; **OT**, occupational therapy; **PCA**, patient-controlled analgesia; **PO**, orally; **PT**, physical therapy; **RT**, respiratory therapy; **SICU**, surgical intensive care unit; **SubQ**, subcutaneous; **TRE**, trauma service

### Clinical Indications

<b>3 or more rib fractures with rib displacement of more than 1 rib cortical diameter</b>
<b>Flail segment</b>
<b>Pulmonary worsening with progressive volume loss on x-ray</b>
<b>Intubation/mechanical ventilation</b>
<b>Use of IV narcotics</b>
<b>Uncontrolled pain when using analgesia or VAS score &gt;6</b>
<b>Lung impalement</b>
<b>Open chest defect</b>
<b>Stabilization on retreat of thoracotomy</b>
<b>Pulmonary herniation</b>

**Figure 3.** Consensus on clinical indications for rib fixation.

VAS, visual analog scale

placed on a breathing machine. Those are the patients we try to select out and operate on to give them the best chance of not being placed on a breathing machine except in the operating room, or to be placed on a breathing machine for as short a time as possible.”

According to Dr. Lottenberg, the University of Florida’s protocol involves plating ribs, but also includes specific and exact management of the trauma patients who arrive at the hospital. Their protocol begins with admission of the patient through the trauma center (Figure 2, page 5).<sup>17</sup> Once rib fractures are identified through the initial chest x-ray or physical examination, the patients proceed to computed tomography (CT) scan; a 3-dimensional reconstruction of the chest wall on CT scan is ordered for any patient with 3 or more rib fractures.<sup>17</sup>

The patient is immediately given an incentive spirometer. Patients who cannot inhale 750 cc or more on a single inhalation are put into the high-risk category for having rib fracture repair. Patients also are seen immediately by the trauma center’s anesthesia management service.

“We have 24-hour availability of anesthesiologists who will come to the bedside, see the patient, evaluate the patient for placement of catheters in the epidural space or in the paravertebral space, place the catheters, and put the patient on continuous infusion of anesthetic agent immediately to begin to relieve their pain so that they can breathe much better and hopefully avoid being put on the ventilator,” said Dr. Lottenberg.

In establishing the protocol, Dr. Lottenberg and his colleagues concluded that the sooner surgical candidates are operated on, the better the outcome. “In our experience at the University of Florida, which is now approaching 100 patients whose ribs have been plated, we find that the optimum time to plate the ribs is within the first 48 hours,” he said. “If you wait

longer than 48 hours, the patient may develop pneumonia and need higher levels of sophisticated ventilation, and the window for operative fixation is lost.”

Even with a protocol in place, however, the management of patients with rib fractures includes a fair amount of clinical decision making. In cases where a patient has isolated rib fractures, the repair may be fairly straightforward. But in those with multisystem injuries, including brain injuries, other abdominal organ injuries, multiple pelvic fractures, or multiple long bone fractures, doctors have to weigh the risk of anesthesia and surgical treatment against the management of those injuries. “With multiply injured patients comes a decision-making process that involves the gestalt of the trauma surgeon to determine whether early rib fracture fixation should be used as part of the overall treatment of the patient,” explained Dr. Lottenberg.

This may be part of the reason why a national protocol has yet to be issued. “I think most of us who treat rib fracture patients on a regular basis do have a protocol, but a lot of these protocols aren’t really published—they’re suggested,” said Dr. Lottenberg. “We hope, after we publish the review of our 100 cases, to put our protocol out there for people to look at it and show that our patients do much better—fewer days in the ICU, on a ventilator, and in the hospital overall.

“But the protocol is not just operative fixation. Any protocol for the management of rib fractures has to include appropriate respiratory care, respiratory therapy, and analgesic and anesthesia pain management related to the rib fractures themselves,” he said.

### Establishing the Clinical Indications And Timing for Rib Fixation

During the Rib Fracture Consensus Meeting, the attendees agreed on the clinical indications for rib fixation in the acute setting which included 3 or more rib fractures with rib displacement of more than 1 rib cortical diameter; flail segment; and being in uncontrolled pain despite adequate analgesia (Figure 3).

The Consensus Meeting group also defined flail chest as being 3 or more consecutive ipsilateral, segmental fractured ribs identified radiographically, in which the outward manifestation is the classic paradoxical motion. The condition also can manifest clinically as impaired pulmonary mechanics leading to diminished cough, ineffective ventilation, and increased atelectasis. Additionally, the experts agreed that multiple consecutive rib fractures may be associated with a similar pattern of unstable chest wall mechanics and impaired function.

An assessment was made on the timing of rib fixation, with the group agreeing that it is best to treat patients within 48 to 72 hours after admission assuming other potentially life-threatening injuries have been treated. Surgical fixation should occur as soon as possible after resuscitation and after triage of other injuries, preferably within 72 hours. The group acknowledged, however, that benefits also may be realized with delayed plating.

For patients with chronic rib pain (ie, non-union pain), gross deformities may result over time when only analgesia is used.<sup>14</sup> Thus, surgical intervention may provide efficacious results in repairing fractures.

## The DePuy Synthes MatrixRIB™ Fixation System

In the United States, there currently are 2 rib fixation systems: Acute Innovations RibLoc System and the DePuy Synthes MatrixRIB™ Fixation System (Figure 4). MatrixRIB is indicated for the fixation and stabilization of rib fractures, fusions, and osteotomies of normal and osteoporotic bone.<sup>18</sup> It consists of strong and flexible titanium alloy locking plates precontoured to fit the average rib locking screws and intramedullary splints.<sup>15,18</sup> Please refer to the MatrixRIB technique



**Figure 4.** The MatrixRIB™ Fixation System.

Courtesy of Thomas W. White, MD

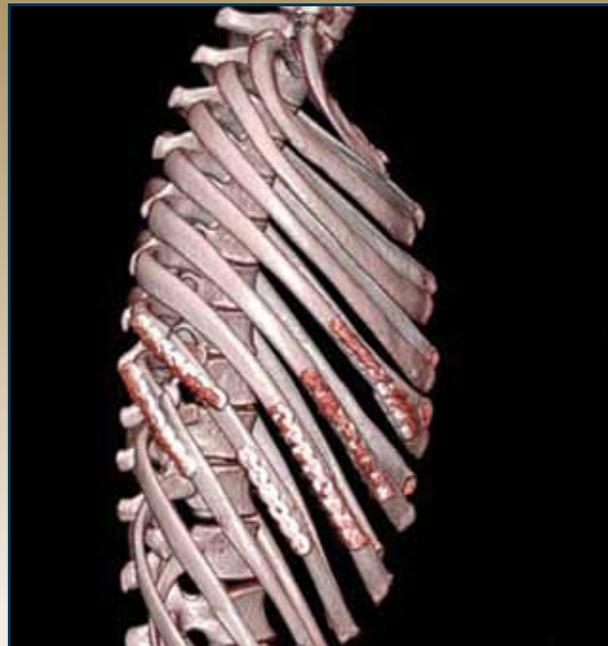
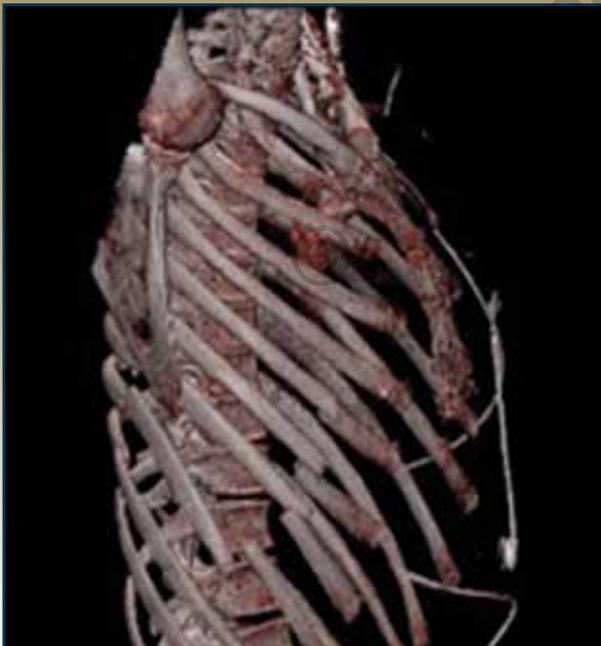
guide and package insert for full indications, contraindications, instructions for use, warnings and/or precautions.

“DePuy Synthes [MatrixRIB Fixation] system’s plates are fairly lengthy and can bridge multiple fractures in a single rib; they’re fitted for both the right and left side of the chest, and for individual ribs based on computer evaluation of human ribs,” explained Dr. Lottenberg. “It’s a very strong but simple system that involves contouring the plate and simply drilling and placing locking screws through both cortices of the rib,” he said. “I’ve been able to plate as high as rib 3, all the way down to rib 10 quite easily with these plates. I found the system to be quite easy to pick up, and it did not require a lot of prior technical work.”

Dr. Gracias appreciated the malleability of the DePuy Synthes plates, which he thought makes the system easy to use, especially for surgeons building a skill set for rib fixation. The educational platform and approach to training enables surgeons to gain a better understanding on ideal patients for rib fixation. “I think DePuy Synthes has done a good job of educating and creating a very solid product, and those 2 things together have helped surgeons become comfortable and proficient in the current techniques that benefit patients,” he said.

### Conclusion

Before surgical rib fixation becomes more widely accepted, surgeons will have to be open to the idea of a more aggressive treatment approach. “I think people are reluctant because this is a paradigm shift, asking surgeons to operate on something that, for as long as surgeons now can remember, we haven’t operated on,” said Dr. Shiroff. “It’s almost the



**Figure 5.** CT scans of a patient who was kicked by a horse (a) before rib fixation and (b) after the procedure.

Courtesy of Adam M. Shiroff, MD

polar opposite of the direction other surgical fields have gone, doing fewer open procedures, interventional radiology, and stopping bleeding from the inside. I think that goes against a lot of what some surgeons see as the evolution of less is more. But I think we've been missing the boat with these rib fracture patients for years."

Surgeons who accept the concept also will need to embrace the challenge of becoming adept at performing surgical rib fixation. "This means doing the right evidence review, training yourself through courses, and staying robust in your surgical education," said Dr. Gracias. "This is a developing field, and people are constantly pushing the envelope to advance surgical techniques, so staying on top of the latest and best approaches to these patients will be one of the challenges."

The Consensus Meeting made several strides in identifying clinical indications for rib fixation and defining flail chest—2 developments that establish the foundation of surgical rib fixation and help define an appropriate patient population for this procedure. With an established protocol, further considerations—the classification of rib fractures and correlation with clinical outcomes; which surgical approach is best; which rib fixation system is best; and whether or not each fracture in a flail chest should be stabilized—will need to be addressed.<sup>9</sup>

Dr. Gracias noted that care of rib fracture patients goes well beyond stabilizing their ribs. "We need pain management, social work, and trauma center resources to resocialize these patients. Trauma surgeons don't just operate on the rib—they operate on the whole patient."

For surgeons already well versed in surgical rib stabilization, however, the rewards are quickly apparent (Figure 5, page 7). To reinforce the benefit of rib fixation, Dr. Lottenberg described a patient who sustained rib fractures in a horseback riding accident. "She came back to our clinic last week, enamored of the difference in the way she felt. She was overwhelmed at how well she'd done after the repair of her injuries," he said. "This lady, no doubt in my mind, will be back on a horse within the month."

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## Learn More

Come hear from the Rib Fracture Consensus Meeting participants at special industry sessions at the annual meetings of the American Association for the Surgery of Trauma (9/19 at 5:00 PM) and the American College of Surgeons (10/8 at 11:25 AM), and stop by the DePuy Synthes CMF booth.

Disclosures: All surgeons who attended the consensus meeting were under consulting agreement with DePuy Synthes.

Dr. Diaz reported that he is a consultant for DePuy Synthes, LifeCell, and Acute Innovations. Dr. Gasparri reported that he is a consultant for and has received honoraria from DePuy Synthes. Drs. Shiroff and White reported that they are consultants and speakers for DePuy Synthes. Drs. Gracias, Lottenberg, and Pohlman reported that they are consultants for DePuy Synthes.

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