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Integrated Multidisciplinary Management of Pelvic Fractures: Tips and Tricks

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Abstract

Pelvic fractures represent complex and life-threatening conditions that necessitate integrated management across multiple healthcare specialties. This paper discusses the critical aspects of multidisciplinary approaches in both the acute and delayed management of pelvic trauma. It outlines the anatomy and pathophysiology of pelvic fractures, emphasizing the importance of understanding the stability provided by ligaments and the implications of fracture classifications. The role of an experienced surgical team is highlighted, especially in emergency settings where immediate recognition of potentially life-threatening hemorrhages and hemodynamic stability takes precedence over anatomical considerations. A coordinated effort among trauma surgeons, anesthesiologists, and radiologists in the emergency department is essential to optimize patient outcomes. The text also addresses the challenges presented by varying ED structures, the necessity for effective communication, and the advancement of imaging technology, which enhances decision-making processes in managing pelvic fractures.

Keywords: Pelvic fractures; multidisciplinary management; hemorrhage control; emergency care; trauma

surgery; patient outcomes; interdisciplinary cooperation; pathophysiology.

Introduction

Pelvic injuries are complex, life-threatening conditions that potentially involve multiple anatomical structures and necessitate coordinated care from various healthcare professionals across multiple specialties¹. These injuries present a diverse range of clinical and radiological signs and are often associated with trauma to other organs and systems, creating a wide array of clinical scenarios that resist straightforward categorical approaches². The prognostic outcomes of pelvic injuries are highly variable and challenging to predict due to their complexity. Like other forms of trauma, the outcomes are contingent upon the type and timing of treatment, with this relationship being particularly pronounced in severe pelvic fractures³. Therefore, it is crucial to involve multidisciplinary team at all phases of treatment⁴. This paper emphasizes both immediate and delayed multidisciplinary management strategies for pelvic trauma patients, highlighting the importance of the prehospital and rehabilitation stages in enhancing outcomes and minimizing long-term sequelae⁵.

Anatomy and Pathophysiology of Pelvic Fractures

The pelvic structure consists of bones and robust ligaments that contribute to its overall stability. Unlike other joints, stability in the sacroiliac and pubic symphysis joints stems solely from the powerful ligaments encompassing them⁶. The primary load-bearing forces of the human body traverse the posterior pelvic structures, extending from the spine to the hips. While anterior pubic structures play a role in biomechanics, their significance pales compared to that of the posterior structures. Clinically significant posterior ligaments include the short ligaments surrounding the sacroiliac joint and the longer ligaments connecting the sacrum to the sciatic tuber and ischial spine (iliolumbar, sacrotuberous, and sacrospinous ligaments). The strength of the pelvic ligaments makes luxation or subluxation a rare occurrence.

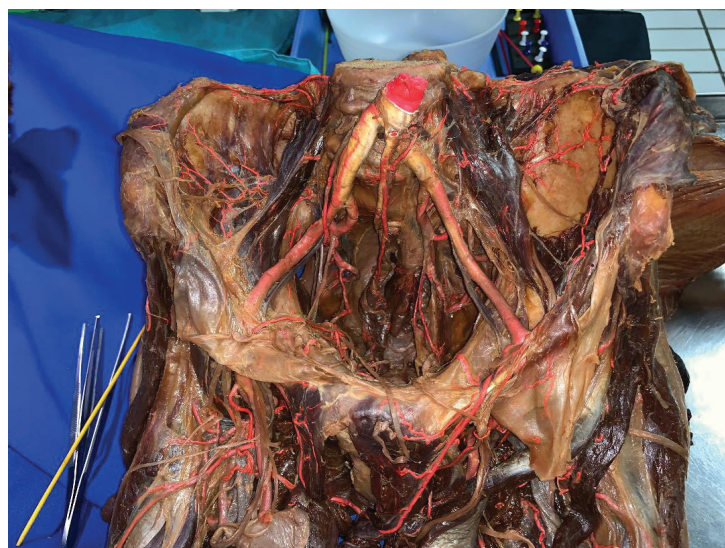
Conversely, pelvic injuries frequently manifest as bony fractures; when energy cannot traverse the bony structure, it is often conveyed as avulsion fractures⁷. In type B fractures, certain ligaments are preserved, ensuring vertical stability of the pelvis. Damage to these ligaments can compromise pelvic stability, particularly when the fracture line traverses the bone anteriorly or posteriorly⁸.

For clinical relevance in orthopedic surgery, the osteoligamentous composition of the injury and pelvic stability is crucial, particularly concerning joint dislocations and their impact on outcomes. A horizontal widening of the pubic symphysis, traditionally defined as 2.5 cm, serves as a critical threshold for treatment approaches and patient outcomes. Biomechanical studies confirm that exceeding this threshold results in disruption of the anterior and partially interosseous sacroiliac ligaments, leading to biomechanical instability⁹. Furthermore, accurate identification of the anterior sacroiliac joint opening through transverse CT scans is vital for treatment planning.

It is essential to recognize that the acetabulum is part of the pelvic ring and is often involved in pelvic ring injuries. Even minor dislocations of intra-articular fractures should be addressed promptly, as they can lead to long-term hip joint complications. Consequently, combined fractures require special emphasis. While pelvic fractures accompanied by non-dislocated acetabular fractures do not necessitate surgical intervention on their own, they can become dislocated during pelvic reduction maneuvers, necessitating fixation prior to pelvic stabilization. The priority in such cases is to address the non-dislocated acetabular fracture (via anterior or posterior approaches)

before proceeding with anterior/posterior pelvic reconstruction¹⁰.

The pelvic complex is highly vascularized, with both venous and arterial networks that can lead to severe hemorrhage¹¹. Hence, contemporary treatment decisions are guided not only by the anatomical type of fracture but also by the hemodynamic status of the injured patient. In cases of polytrauma, physiological injuries take precedence over purely anatomical considerations, necessitating aggressive resuscitation and damage control strategies, particularly in addressing bleeding and coagulopathy¹².



Picture 1: Picture in cadaver, showing the complex arterial and venous net of pelvic blood vessels

Studies indicate that 5-14% of pelvic fractures are associated with life-threatening hemorrhaging¹³. For this subset of patients, implementing appropriate physiological resuscitation with blood and blood products and other measures is critical. Furthermore, identifying this small but significant group at risk for adverse outcomes is vital. Specific laboratory and clinical parameters have been established to assist in recognizing these patients¹⁴.

An informal consensus suggests that experienced surgeons can identify high-risk patients with pelvic fractures upon hospital admission. Hence, it is widely recommended that a senior surgeon be involved in the management of every pelvic fracture from the outset¹⁵. The prevailing assertion that unmanageable hemorrhage is the primary cause of mortality in pelvic fractures underscores the significance of addressing hemorrhagic control over anatomical considerations in terms of survival¹⁶. Understanding

the anatomy and pathophysiology of pelvic fractures is essential for devising multidisciplinary strategies in the emergency department for acute management¹⁷.

Multidisciplinary Approach to Pelvic Fracture Management in the Emergency Department

Injuries to the pelvis are frequently encountered in the emergency department, often involving complex interactions among various anatomical structures due to their proximity to the pelvic bones. This scenario necessitates precise coordination among various medical specialties. Successful management relies on effective collaboration, which significantly impacts patient outcomes, particularly during the initial admission period and acute treatment. The integral involvement of trauma surgeons, vascular surgeons, urologists, and occasionally neurosurgeons is crucial to prevent complications and enhance recovery outcomes. Effective communication and synchronized efforts among these specialists further improve the likelihood of survival and favorable long-term recovery for patients¹⁸.

Differences in structures, equipment, and personnel across countries and hospitals contribute to variability in emergency department practices. Lack of standardization for trauma services, particularly in developing countries with limited resources, complicates the treatment of polytrauma patients, especially those with pelvic fractures. Variabilities, such as the availability of pelvic binders, resuscitation protocols, and variations in transport methods to hospitals, make establishing a universal treatment protocol challenging¹⁹.

In contexts without emergency medicine specialists, such as North Macedonia, a robust coordination model among trauma surgeons, anesthesiologists, and radiologists becomes imperative. This collaborative effort should initiate in the prehospital phase and extend through initial assessments, diagnostic imaging, and emergency surgical interventions²⁰.

During the acute treatment phase, the anesthesiologist or emergency specialist plays a vital role. Adhering to the ABCs (Airway, Breathing, Circulation) of Advanced Trauma Life Support (ATLS) protocols enables these specialists to ensure airway patency and adequate ventilation, particularly for patients not intubated during transport. The presence of an experienced anesthesiologist in the emergency department is essential for rapid intubation and resuscitation. Close collaboration between surgeons, anesthesiologists, and radiologists is critical

in determining whether a patient is stable enough for diagnostic procedures, requires intensive care for further stabilization, or needs immediate transfer to the operating theatre for damage control strategies²¹.

Debates surround leadership during polytrauma management, with practices differing between institutions and countries. Some settings see decisions made jointly by the surgeons and anesthesiologist, emphasizing the necessity for interdisciplinary cooperation in this critical phase²².

Key components of this phase include advanced airway management, hemodynamic stabilization, the administration of blood products, fracture assessments, preoperative optimization, temporary stabilization, preoperative planning, and coordination with radiologists for endovascular procedures. Continuous patient monitoring regarding hemodynamic status and procedural tolerance during transport is paramount. Surgeons and anesthesiologists often have different perspectives regarding surgical burden and procedure timelines in the emergency department, presenting challenges in aligning priorities within time-sensitive settings. This challenge can be amplified when non-trauma surgeons, who may lack experience in damage control strategies, are responsible for managing polytrauma patients with pelvic injuries. Understanding the essence of interdisciplinary teamwork in these moments is crucial for improving patient survival and outcomes. A coordinated approach that synthesizes rapid physiological stabilization with timely surgical intervention exemplifies the efficacy of collaborative medicine in critical scenarios²³.

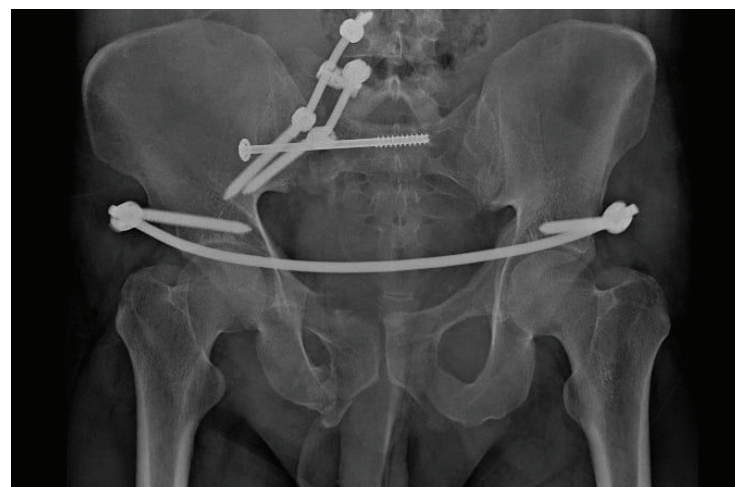
The role of radiologists is also critical. Traditionally, radiology services, particularly CT scanners, have not been located within EDs, and reliance on ATLS protocols often resulted in time-consuming processes, leading to potential misdiagnosis of critical injuries. Technological advancements have introduced high-speed, high-resolution CT scanners with contrast, portable X-rays, and ultrasound directly into emergency departments, allowing for improved proximity between radiologists and trauma teams. This asset enables collaborative assessments of life-threatening injuries and associated conditions more effectively. Enhanced diagnostic precision through the concurrent use of imaging modalities not only identifies fractures but also evaluates visceral and vascular injuries. Immediate and accurate interpretation by radiologists empowers surgeons to make timely and informed decisions regarding urgent interventions for pelvic trauma.

In conclusion, the comprehensive multidisciplinary management of pelvic fractures demands an understanding of complex anatomy and pathophysiology, alongside a coordinated approach to treatment that incorporates emergency and surgical care, optimal training, and resource allocation to enhance patient outcomes in trauma settings.

Multidisciplinary Approach in the Operating Theatre

Multidisciplinary Approach to Posterior Pelvic Ring Injury
Posterior injuries in high-energy spinopelvic traumas frequently involve the sacrum and may extend proximally to the spine, creating significant diagnostic and therapeutic challenges. The operative management of combined pelvic and spinal fractures varies across hospitals, influenced by institutional practices and the specialties available at each site. In cases involving nerve injuries, the expertise of neurosurgeons is often required, adding further complexity to treatment²⁷.

High-energy spinopelvic fractures, including spinopelvic dissociation, typically necessitate the involvement of three distinct surgical specialties: pelvic trauma or orthopedic surgeons, spine trauma or orthopedic surgeons, and neurosurgeons. Each specialist brings unique experience essential for addressing the intricate nature of these injuries. In some institutions, trauma surgeons are trained to perform all three roles, which requires a broad skill set and frequent exposure to such pathologies. The combination of pelvic, spinal, and neurological injuries demands not only a diverse array of surgical competencies but also specialized equipment, such as a range of instruments, implants, a radiolucent operating table, and a C-arm for intraoperative imaging²⁸.



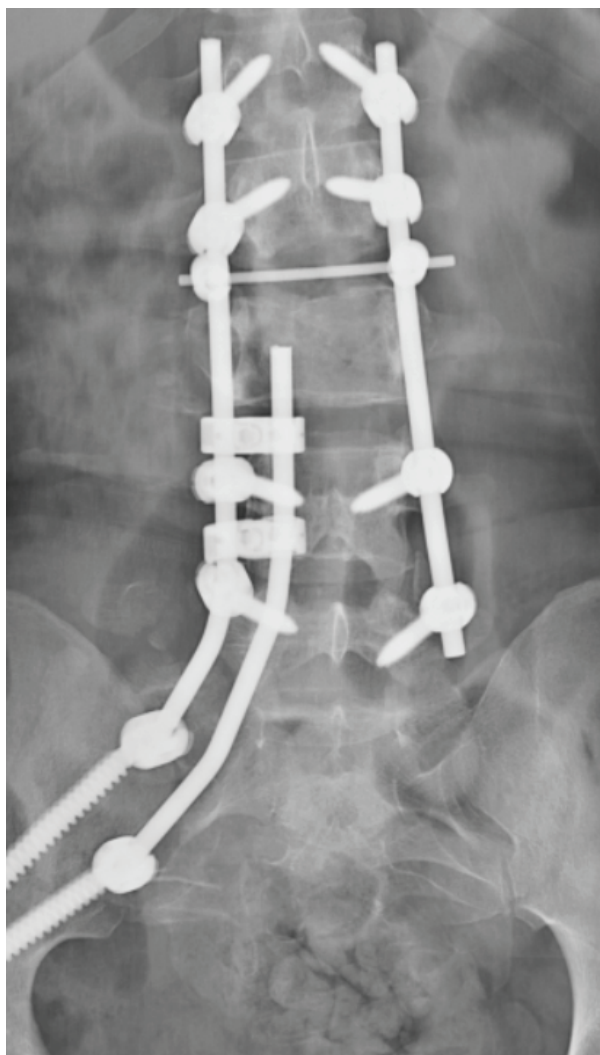
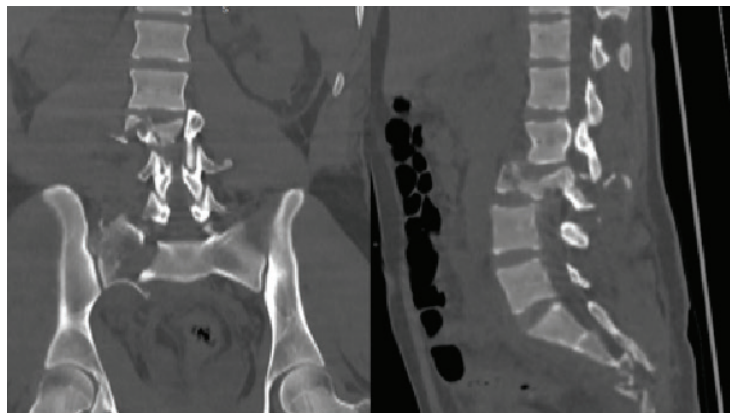
Picture 2: Posterior ilio-lumbar fixation and anterior fixation (in-fix) of pelvic fracture

From the outset, a multidisciplinary approach is vital to ensure optimal surgical outcomes. Preoperative preparation must account for the needs of all relevant specialties, including the spine surgeon, pelvic surgeon, and neurosurgeon. Key considerations involve utilizing an X-ray-transparent operating table for optimal views of the pelvis and precise patient positioning to meet the requirements of each surgical discipline, especially for neurosurgeons utilizing microscopes for nerve-related interventions. Effective communication and coordination among the surgical team are essential for reducing procedural time and enhancing safety, consequently minimizing complications.

Specialized implants and techniques for ilio-lumbar fixation play a critical role in managing spinopelvic fractures, providing greater stability and improved patient outcomes. Modern implants, such as lateral offset connectors and rod-to-rod connectors, facilitate more effective iliac-to-lumbar constructs, significantly reducing operative time compared to traditional three-dimensional rod modeling. The conventional approach to rod modeling is technically challenging, particularly with robust rods needed in these cases, as it is time-consuming and increases the risk of implant failure due to excessive mechanical stress on pedicle screw heads. Long, thick, polyaxial pedicle screws are essential for securely anchoring iliac screws within the iliac wing to the lumbar construct, ensuring stability against regional biomechanical forces. Additionally, modern polyaxial screws often feature smaller heads designed to prevent skin irritation and pressure sores, which are common complications associated with such screws. It is essential to note that the supra-acetabular space poses challenges for spine surgeons unfamiliar with pelvic anatomy, underscoring the need for collaboration among various specialties in managing these complex pathologies²⁹.

Innovations such as the S2AI (sacro-alar-iliac) screw represent significant advancements in pelvic surgery, particularly within ilio-lumbar fixation. The polyaxial head of the S2AI screw aligns with lumbar pedicle screws, producing a mechanically stable and durable construct. This technique offers a new standard for spinopelvic fixation due to its superior biomechanical characteristics and compatibility with spinal instrumentation. However, the complexity increases as identifying the trajectory for S2AI screws necessitates sacroiliac joint transfixion. It can be difficult to feel the bone channel, as with spine

pedicle screws, due to resistance from the cortices of the sacroiliac joint. Thus, specialized inlet projections of the pelvis are necessary to prevent inadvertent exits by the probe and screw, adding another level of challenge to this technique. Utilizing 3D or CT navigation can enhance safety throughout the procedure³⁰.



Picture 3: Pre and postoperative combined sacral and pelvic fractures solved with spinopelvic instrumentation.

The successful use of these advanced implants and techniques heavily depends on the expertise of the surgical team, particularly the scrub nurse, who must be adept with the specific instruments and implants involved. The complexity of modern ilio-lumbar fixation systems requires a highly trained scrub nurse capable of efficiently managing specialized equipment, thereby significantly reducing operative time and enhancing procedural accuracy. Additionally, the consistent presence of a company representative familiar with the implants and instruments is invaluable. Their expertise ensures proper handling and application of the equipment, leading to reduced operative durations and improved surgical outcomes³¹.

Close collaboration with radiologic technicians is crucial during these procedures. Their expertise in producing precise, high-quality X-ray images is vital for reducing operative time, ensuring accurate implant placement, and preventing misplacement. High-quality imaging also minimizes radiation exposure for both patients and surgical personnel, enhancing safety and reducing anxiety among team members. The radiologic technician's proficiency in positioning the C-arm and optimizing image clarity directly contributes to procedural success and overall surgical workflow efficiency. The integration of modern technologies, such as intraoperative CT scanning, navigation systems, and robotics, further enhances the precision of ilio-lumbar fixation. These advanced tools require skilled personnel to operate and maintain them effectively. Experienced technicians contribute to superior imaging acquisition, reduced risk of implant misplacement, and the protection of equipment integrity. By leveraging these technologies and fostering collaboration among well-trained scrub nurses, radiologic technicians, and company representatives, the surgical team can optimize outcomes, minimize complications, and achieve the best possible results for patients with complex spinopelvic fractures³².

Multidisciplinary Approach to Anterior Pelvic Injury

Anterior approaches to the pelvico-acetabular ring present significant technical challenges due to the complex anatomy and proximity to critical neurovascular structures. These procedures often necessitate the involvement of multidisciplinary surgical teams, including urologists, vascular surgeons, and occasionally abdominal surgeons, to ensure safe and effective outcomes. The intricate nature of these approaches requires surgeons to have advanced general surgery skills, particularly in soft tissue



handling, given the demanding manipulation of delicate tissues in this region³³.

Two anterior approaches are commonly used in clinical practice: the Ilioinguinal approach, as described by Letournel, and the Anterior Intrapelvic (AIP) approach³⁴. These techniques necessitate meticulous attention to detail and a comprehensive understanding of pelvic anatomy. Due to the complexity of soft tissue management involved, it is recommended that these procedures be performed by surgeons with specialized expertise in soft tissue surgery, rather than those whose training is primarily in orthopedic or bone surgery. This distinction is critical, as the scope of practice and terminology for orthopedic surgeons, traumatologists, and general surgeons can vary significantly across different countries and healthcare systems.

A notable challenge during these procedures is the risk of vascular injury, particularly in the AIP approach. Injuries may occur due to a trauma-orthopedic surgeon's lack of familiarity with soft tissue proximity and manipulation. The external iliac vein and the bifurcation of the common iliac artery are particularly vulnerable during these approaches. The narrow, deep, and poorly illuminated surgical field complicates the management of such complications, making it essential to have a vascular surgeon readily available, if not actively involved, during these procedures³⁵.

The involvement of a urologist is also vital in the diagnosis and management of traumatic and iatrogenic bladder injuries, which may occur during anterior approaches to the pelvico-acetabular ring. The proximity of the bladder to the pubic bones makes it particularly susceptible to injury during complex dissections or in the presence of pelvic fractures. Urologists play a crucial role in preoperative evaluation, often employing imaging techniques such as cystography to identify bladder injuries, as well as in intraoperative management, including the repair of bladder perforations or lacerations. Their timely intervention is essential for preventing complications such as urinary leakage, infection, or fistula formation, significantly improving patient outcomes during these procedures. Minimizing these risks necessitates effective preoperative planning and intraoperative collaboration³⁶.

A vascular surgeon is typically on call during AIP procedures to address potential complications promptly. Furthermore, ongoing training and interdisciplinary communication are vital for improving surgical outcomes and reducing the incidence of iatrogenic injuries in these complex cases³⁷.

By prioritizing soft tissue expertise and fostering a collaborative surgical environment, we aim to enhance the safety and efficacy of anterior approaches to the pelvico-acetabular ring, ultimately improving patient outcomes in these challenging procedures³⁸.

Multidisciplinary Approach in the Immediate Post-operative Period in the ICU

Following surgical intervention, the focus in the ICU phase is on ongoing resuscitation and monitoring to optimize outcomes for polytrauma patients with pelvic fractures.

Critical care management of polytrauma patients—defined as individuals with multiple severe injuries across various body systems—presents significant challenges in the ICU. This process is inherently interdisciplinary and necessitates effective communication among surgeons, anesthesiologists, intensivists, and other specialists to optimize patient outcomes. Upon admission to the emergency department following high-impact trauma, such as motor vehicle collisions or high-level falls, the initial management focuses on stabilizing life-threatening conditions. Subsequent care in the ICU involves ongoing resuscitation and preparation for surgery. While some patients with isolated injuries may be managed conservatively without immediate operative intervention, most polytrauma cases require ICU admission for continuous resuscitation, preoperative stabilization, and monitoring to mitigate the risk of shock or organ failure³⁹.

A critical element in managing pelvic fractures in polytrauma patients is a shared understanding between anesthesiologists and surgeons regarding temporary stabilization techniques. The application of a pelvic binder or improvised fixation, such as a sheet, can reduce fracture displacement and minimize additional hemorrhage during ICU procedures, including patient repositioning or diagnostic imaging. Effective implementation of these measures is essential to prevent catastrophic blood loss and enhance patient outcomes⁴⁰.

Communication regarding the feasibility of applying external fixators in the ICU is crucial. Although traditionally performed in the operating theater, emergency application of a trans-iliac external fixator in the trauma bay, emergency department, or ICU is safe for unstable patients or when surgical facilities are unavailable. Swift intervention in critically unstable patients or those showing rising lactate levels can prevent worsening coagulopathy and improve overall outcomes⁴¹.



Collaboration between surgeons and anesthesiologists is essential for effective decision-making in the ICU. Treatment decisions should integrate both surgical and anesthetic perspectives to avoid compartmentalization, which can lead to suboptimal outcomes. For example, neglecting an anesthesiologist's input on fluid resuscitation may result in intraoperative instability, underscoring the importance of unified interdisciplinary management⁴².

Central to assessing the multiply injured patient is recognizing the “four vicious cycles”: hemorrhagic shock, hypothermia, coagulopathy, and soft tissue injury. These interconnected elements drive ICU decision-making, influencing subsequent procedures and overall treatment strategies. The addition of soft tissue injury to what was once termed the “trauma death triangle” highlights its significance, particularly in injuries to the thorax, abdomen, pelvis, and extremities with an Abbreviated Injury Score (AIS) greater than 3. This framework paints a vivid picture: a patient trapped in these cycles may spiral from initial shock into widespread inflammation, emphasizing the urgency of breaking this chain through targeted interventions⁴³.

Based on these parameters, polytrauma patients can be stratified into categories: stable, borderline, unstable, or in extremis. Stable patients and responsive borderline cases may proceed to standard orthopedic procedures under the Early Total Care (ETC) strategy, provided that their parameters remain steady during surgery. ETC, which emerged as a foundational approach to modern polytrauma management in the late 1970s, advocates for definitive fixation of all major fractures early on, aiming to restore mobility and prevent complications like fat embolism or prolonged immobility. This strategy revolutionized care by shifting from delayed interventions to proactive stabilization, as shown in historical cohorts where early fixation reduced pulmonary complications and hospital stays⁴⁴.

Conversely, for unstable or critically ill patients, the Damage Control Orthopedics (DCO) strategy is employed to bridge vulnerable periods and prevent the “second surgical hit”—additional operative stress that could lead to adverse outcomes, including early and late complications or mortality that might otherwise be preventable. In pelvic fractures, tools like external fixators or the Ganz anti-shock pelvic clamp provide temporary stabilization until a “window of opportunity” for definitive surgery opens. This cautious approach stems from lessons learned in high-mortality cases, where aggressive

early surgery overwhelmed already compromised physiology⁴⁵.

However, the binary divide between ETC and DCO has faced criticism in recent literature, particularly due to complications associated with prolonged external fixation in DCO, such as pin-site infections or delayed union. This scrutiny prompted the development of refined paradigms. As described by Vallier and colleagues in their 2013 study on creating a protocol for timing orthopedic surgery in multiple trauma patients, the Early Appropriate Care (EAC) strategy broadens the indications for ETC while narrowing those for DCO. By increasing the value of the thresholds for lactate and emphasizing its post-resuscitation dynamics rather than a fixed value—similar to pH and base excess—EAC allows for safer, earlier definitive interventions in a broader patient subset. This personalized approach considers a patient's initial elevated lactate, which trending downward after fluid therapy may permit earlier surgery, ultimately reducing overall morbidity⁴⁶.

Building on this, Pape and associates, in their 2015 exploration of advancements in polytrauma management, emphasize the importance of restoring the patient's overall physiology over isolated biochemical markers, such as lactate levels alone. They advocate for transcending dichotomous strategies by incorporating dynamic patient parameters into the assessment process, recognizing the interplay between prehospital care, operative timing, and postoperative complications, and treating each patient as a unique case requiring individualized decisions⁴⁷. Ultimately, this individualized approach—integrating physiological and biochemical insights with the combined expertise of anesthesiologists and surgeons—culminates in the Safe Definitive Surgery (SDS) concept for managing polytrauma. SDS represents an evolutionary advancement, promoting continuous assessments to balance early definitive care and damage control as warranted. In practice, this may involve monitoring a patient's response to initial resuscitation in the ICU before opting for definitive fixation once stability is confirmed, thereby minimizing risks while maximizing recovery potential. This comprehensive narrative not only corrects past oversimplifications but also fosters a multidisciplinary ethos, ensuring that the polytrauma patient's journey concludes with resilience rather than regret⁴⁸.

In cases of biomechanically unstable pelvic fractures in hemodynamically compromised polytrauma patients, surgical treatment typically begins with stabilizing the

pelvis through damage control measures, primarily utilizing a pelvic binder in prehospital settings and an external fixator in-hospital. The use of a C-clamp is rarely indicated, and recent literature reflects ongoing controversies surrounding its application. Preperitoneal pelvic packing and angioembolization for arterial sources are also integral components of the emergency protocols for these cases. Damage control resuscitation—including permissive hypotension and blood transfusion protocols—proves invaluable in managing pelvic injuries.

The timing for definitive fixation is guided by the Early Appropriate Care/Safe Definitive Surgery (EAC/SDS) criteria, determining when the patient is stable enough to tolerate the stress of major surgery while maintaining hemodynamic stability and coagulation. Monitoring lactate levels serves as a crucial indicator of peripheral tissue perfusion and a sensitive parameter for identifying occult and significant hypoperfusion. Specifically, a lactate level of <4 mmol/L (or <2.5 following resuscitation measures) indicates a trend towards the correction of metabolic acidosis and the readiness of the injured patient for definitive fixation. According to the SDS protocol, lactate levels greater than 2 mmol/L are considered borderline, while levels exceeding 4 mmol/L denote instability.

If these parameters demonstrate stability, the patient is deemed suitable for surgery; however, total definitive fixation of all fractures is not necessarily required. If metabolic parameters become unstable during the operation, the patient is returned to the ICU for further stabilization, potentially reverting to damage control strategies until physiological recovery allows for definitive open major pelvic surgery. This treatment strategy for pelvic injuries in polytrauma represents a continuum of physiological recovery that directly influences surgical interventions, constituting the best approach for saving lives and improving outcomes⁴⁹.

Early mobilization is a critical objective for the treatment team, particularly in cases where patients have experienced pelvic fractures accompanied by degloving soft tissue injuries. The prompt initiation of movement and rehabilitation can significantly mitigate the risk of complications, such as gangrene and necrotizing soft tissue infections, which may arise from inadequate patient positioning and prolonged immobilization. These infections can escalate quickly, resulting in severe consequences, including systemic shock or the necessity for extensive surgical interventions. Prolonged immobilization can also lead to increased swelling, muscle atrophy,

and further tissue damage, as pressure builds in vulnerable areas, compromising blood flow and elevating the risk of microbial colonization. By focusing on early mobilization and maintaining optimal patient positioning, the treatment team aims not only to enhance the overall recovery trajectory of patients but also to promote improved circulatory dynamics and tissue perfusion, thereby reducing the incidence of catastrophic complications. This proactive approach can lead to enhanced functional outcomes and a shorter recovery time for patients experiencing these complex injuries, ultimately safeguarding their health and improving quality of life⁵⁰, in particular in obese patients⁵¹.

The key controversy between surgeons and anesthesiologists centers on when to administer thromboprophylaxis. Anesthesiologists prefer to delay administration until after hemodynamic stabilization due to bleeding concerns⁵², whereas surgeons favor early administration—typically within the first 24 to 48 hours—to reduce VTE risk, which can reach 60% without prophylaxis in pelvic trauma⁵³.

Differences between surgeons and anesthesiologists extend to their preferred approaches for intraoperative coagulation monitoring and management. Anesthesiologists favor conventional tests, such as INR, APTT, and D-dimer, while trauma surgeons prefer intraoperative viscoelastic testing (e.g., ROTEM or TEG) to obtain real-time information on fibrinogen levels and platelet function for guiding transfusion decisions. These differing approaches also underpin a subtle controversy regarding Tranexamic acid use: surgeons advocate a preoperative 1g bolus for improved haemostasis, whereas anesthesiologists recommend caution due to potential postoperative VTE complications. Further study is needed to clarify these controversies.

Conclusion

The treatment of pelvic fractures is a complex, interdisciplinary, and dynamic process that involves a diverse array of trained medical personnel, including various specialists. The integration of these specialists—trauma surgeons, anesthesiologists, spine surgeons, neurosurgeons, radiologists, vascular surgeons, urologists, and occasionally abdominal surgeons—is critical during all phases of hospital care for patients with pelvic fractures. The complexity of care intensifies significantly when pelvic fractures are accompanied by other injuries, especially when they disrupt the physiology of patients

within a polytrauma context. This paper emphasizes the importance of collaboration and the diverse expertise required in the treatment phases for these patients. Proficiency in advanced pelvic fixation techniques and awareness of physiological disturbances are essential at all treatment stages for individuals with pelvic injuries. The coordinated expertise of various medical specialties within a patient-focused approach exemplifies the model of collaborative excellence in the management of pelvic fractures⁵⁴.

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