



**Alasdair Bott, MBBS, MSc, FRCSEd (Tr&Orth), Dip Hand Surg (Br)** is an Orthopaedic Trauma Fellowship Trainee at North Bristol NHS Trust. His training in trauma and reconstructive surgery has been put to use in South Africa, Malawi, Cambodia and Myanmar. He has published research on long-term patient reported outcomes following pelvic fractures.



**Graeme Nicol FRCS** completed his Orthopaedic Surgical training in Dundee, Scotland in 2018. He then undertook six-months of arthroplasty training followed by a six-month trauma fellowship concentrating on pelvic and acetabular fractures fixation at Southmead Hospital, Bristol, England. Currently Graeme is in Ottawa, Canada completing an arthroplasty fellowship including hip preservation surgery.



**Tim Chesser, MBBS, FRCS** is a Trauma and Orthopaedic Surgeon at North Bristol NHS Trust with a subspecialty interest in Pelvic and Acetabular Surgery. He is Chair of the NICE clinical guideline and expert topic group for Hip Fractures, BOA representative for the National Hip Fracture Database and is the current President of the Orthopaedic Trauma Society.

# The hidden side of pelvic fractures: Urological and sexual dysfunction following injury

Alasdair Bott, Graeme Nicol and Tim Chesser

The anatomy of the pelvis dictates that the structure and function of the urogenital tract are at particular risk of injury in patients with pelvic fractures. Whilst impotence and incontinence are not life-threatening conditions, they have the potential to profoundly affect the psychosocial wellbeing of patients.<sup>1</sup>

**T**he negative impact on quality of life extends into matters of relationships, sleep, travel, work, sport and hobbies. Both the recognition and optimal management of these injuries, is lacking. When there is not an obvious structural deficit, such as a bladder rupture, many go initially unrecognised and untreated. This, despite explicit national guidance emphasising the need to be vigilant and investigate early, with a BOAST guideline dedicated to the identification of the problem<sup>2</sup>, treatment occurs at an interface of orthopaedic and urological surgery and is often unfamiliar territory to both surgical specialities.

When trying to improve outcomes in trauma, we need to recognise both early and late problems that arise as a result of injury. For polytraumatised patients cared for by orthopaedic surgeons, issues of urological or sexual nature may seem less important than pelvic ring stability and management of other musculoskeletal injuries. This is a developing research area, but we are recognising the incidence is significantly higher than previously thought and very little is known about the long-term impact of pelvic fracture on urinary and sexual outcomes.<sup>3,4</sup>

## Anatomy of Injury

The enormous energy required to disrupt the pelvis is usually transmitted via a blunt force,

meaning genitourinary injuries occur in up to a third of pelvic fractures.<sup>5</sup> They are primarily classified according to the anatomy of bladder or urethra, but may also involve the rectum or lumbosacral plexus. Two thirds of patients with pelvic fractures suffer injuries to multiple body regions.<sup>6</sup>

Bladder ruptures occur in 9-16% of pelvic fractures and can be intraperitoneal (30%), extraperitoneal (60%) or combined (10%).<sup>7</sup> Intraperitoneal injuries can result from massive energy transfer to a full bladder at the time of trauma, causing rupturing through the weakest point on the superior dome of bladder wall. Intraperitoneal injuries leak urine into the abdominal cavity, whereas extraperitoneal injuries can communicate with fracture haematoma leading to infection.<sup>7</sup> (Figure 1)

## Urethra

Urethral patterns differ according to the anatomy of males and females and are considered separately.

Pelvic Fractures with Urethral Injury (PFUI) occurs in 10% of all pelvic fractures, although injury to the male urethra occurs far more commonly than in females at a ratio of 28:1.<sup>8</sup> The long male urethra is anchored at the prostatomembranous junction to the pubic

bone, making this area particularly prone to injury at time of trauma. In the long term, urethral injuries can lead to urethral stricture causing poor flow, infection, incontinence and erectile dysfunction.<sup>7</sup>

Injury to the unanchored female urethra usually occurs anteriorly from direct bone damage. Urethral avulsion from the bladder neck can occur, leading to incontinence and voiding problems. Vaginal injuries and tears from bone fragments can be a missed source of open fracture.<sup>9</sup>

### Urological and Sexual Dysfunction

Urological and sexual dysfunction after pelvic fracture remains a sensitive topic that both doctors and patients find difficult to discuss, its complexity makes it harder to fully understand. Undoubtedly both physical and psychological factors play a role. Whilst

sexual and urological function deteriorates with age, the majority of patients with pelvic fractures occur in young adults and at the beginning of their sexual lives.<sup>10,11</sup>

Early identification of pelvic fractures with genitourinary injury (GUI) is critical to ensure appropriate care of the patient. But in the longer term associated GUI found to be a risk factor for more severe sexual dysfunction.<sup>12</sup> However, not only those with GUI experience sexual dysfunction, up to 30% of patients without injury to the urogenital tract experience symptoms.<sup>4,13</sup> In men, symptoms of sexual dysfunction are assessed by asking such question as do you have confidence in achieving erection? Are you able to achieve erections sufficiently hard to engage in penetrative intercourse? Can you maintain an erection? Are you able to complete intercourse achieve satisfaction?<sup>14,15</sup> The description of complete erectile dysfunction

is defined 'erection not sufficiently firm enough for sexual penetration'. For men with urethral injury approximately 42% experience persistent impotence, with a vascular cause thought to be responsible for around 80% of these cases, 20% due to neurological injury.<sup>3,16</sup>

Pain, or dyspareunia, is a common complaint in female patients with pelvic fractures. Mechanical causes such as misplaced metalwork and bone spikes may be responsible in some cases. Long term issues in lubrication and sexual satisfaction are reported in up to two thirds of patients.<sup>3,17</sup>

New urinary dysfunction occurs in up to 40% of patients after pelvic fractures, and appears to occur at equal rates in males and females.<sup>3</sup> Two-thirds of patients with new sexual dysfunction also suffered from urinary dysfunction. Incontinence, the involuntary leaking of urine, causes intense distress and embarrassment to patients and is linked to depression and reduced quality of life.<sup>18,19</sup> Other issues include increased frequency occurring both day and night, and voiding problems of reduced and painful flow or urinary retention.<sup>20</sup>

### Outcome Measures

The study of functional outcome and quality of life in patients with pelvic fractures is dauntingly complex and there is so much we are yet to learn. Through the influence of the Trauma Audit and Research Network (TARN), we have recognised the need to measure functional outcome following injury.<sup>21</sup> This helps to evaluate the patient quality of care and influence trauma and rehabilitation services. It also helps to evaluate the cost effectiveness of such treatments as available such as medication, intracavernous injection, microvascular reconstruction to penile prosthetics.<sup>5</sup>

The TARN registry recommends several generic outcome measures to be used in trauma, these include the EQ-5D and the Glasgow Outcome Score Extended (GOS-E).<sup>21</sup> These measures allow assessment of global function and quality of life; however, they have been shown to be insufficiently sensitive to identify urological or sexual dysfunction. So how best can we measure urological and sexual outcome? Disease-specific questionnaires have the potential for greater sensitivity and most validated tools are gender specific. Research into erectile dysfunction is a considerably more developed topic than urinary incontinence, perhaps this is a consequence of market forces regarding the treatments available for erectile dysfunction.

In outcome studies following pelvic fracture many researchers have designed their own >>

**“Pain, or dyspareunia, is a common complaint in female patients with pelvic fractures. Mechanical causes such as misplaced metalwork and bone spikes may be responsible in some cases. Long term issues in lubrication and sexual satisfaction are reported in up to two thirds of patients.”**

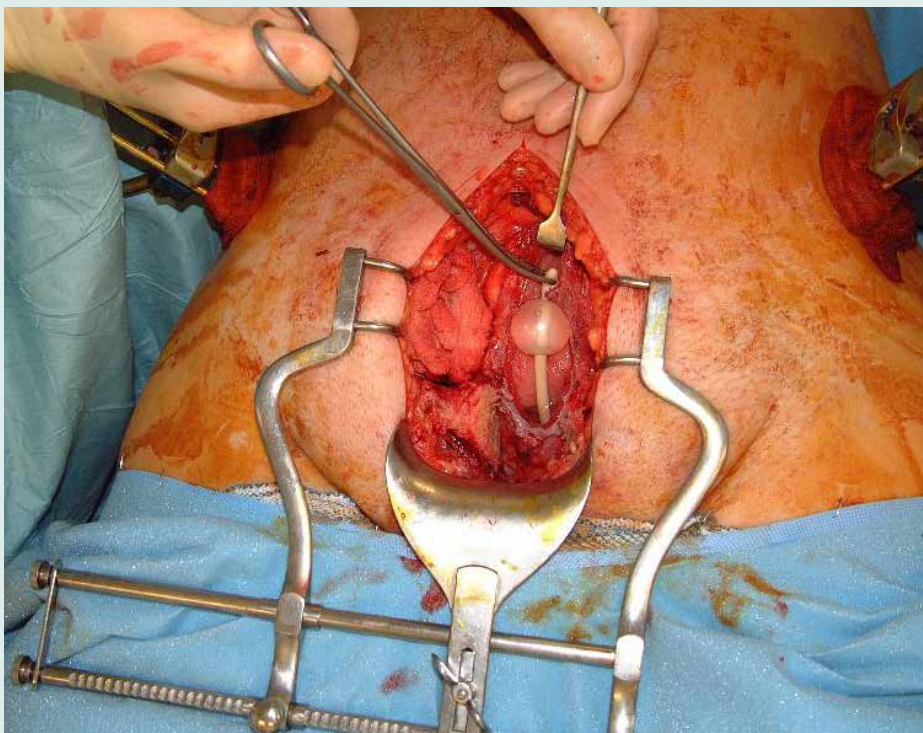
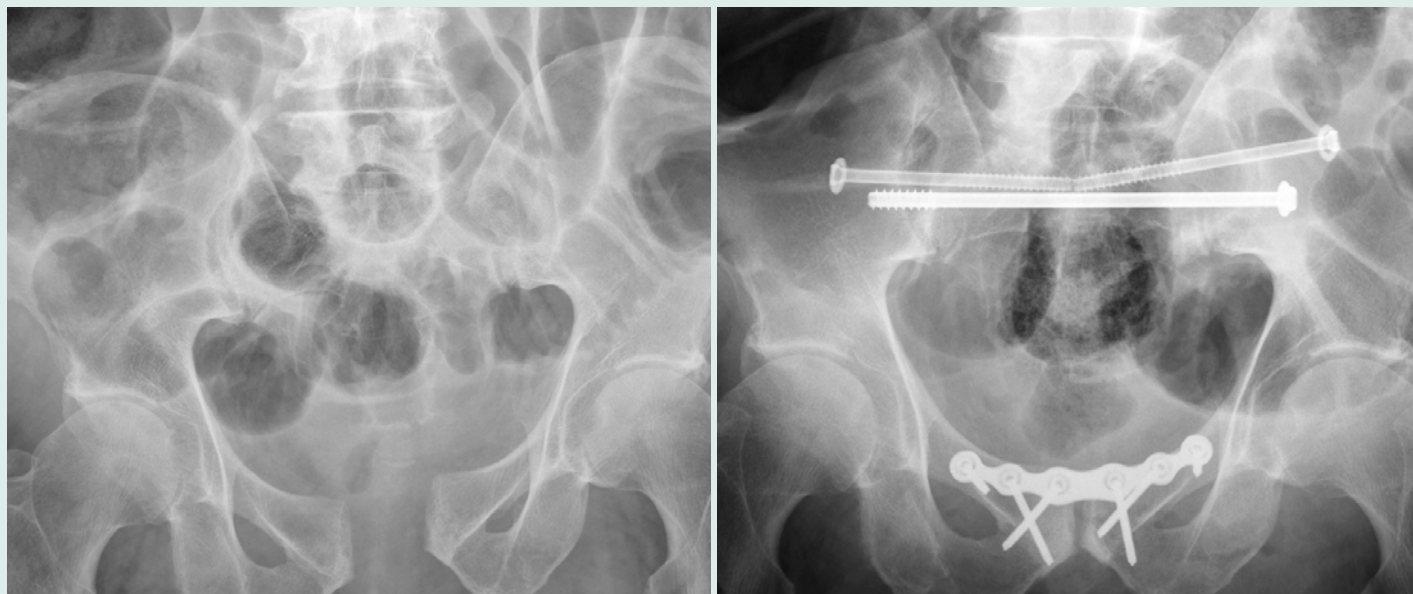


Figure 1: Direct trauma to the urogenital system can be very clear at the time of injury. However this paper shows that distressing long-term genitourinary dysfunction occurs frequently even without obvious direct injury.<sup>1</sup>



X-ray of a male patient with pelvic ring injury before and after surgical fixation

questionnaires, probably the most commonly used validated measure for sexual function is International Index of Erectile Function (IIEF) for male patients and the Female Sexual Function Index (FSFI).<sup>4,22,23</sup> This seems to be appropriate for use in pelvic fracture, in that it is gender specific, sufficient detail to make it useful, but at only 15 questions, it avoids the risk of questionnaire fatigue.

There have been no reported trials in the literature of urinary outcomes after pelvic fracture using a validated urinary outcome

PROMs. Many of the available urological questionnaires are focused on the performance of a certain urological conditions such as prostate cancer or female stress incontinence, and as such they are often not suitable for use in trauma

patients.<sup>9,24-26</sup> Our institution was instrumental in the development of the International Consultation on Incontinence (ICI) modular questionnaires and have found this to be the most appropriate tool for this purpose. With symptoms scored in three domains of frequency, urgency and incontinence it also contains a 'Bothersomeness' score, which can be used to judge overall patient perceived severity.<sup>24,27</sup>

### Long-Term Outcomes Study

There is a problem with judging outcome. We found in a study of 56 male patients 15

years after pelvic fracture that there was no correlation between the generic EQ-5D measure and disease specific measures for urinary and sexual outcome. Furthermore, there was only poor correlation between sexual function and urological function. Whilst 19% of our patients had some form of neurological impairment, 70% reported sexual impairment, 37% of which was classified as severe. Only eight percent of patients reported no problems with their urinary function, and 70% some form of continence issues.

**“The BOAST guidelines, highlight the need to identify early, those patients with GUI to prevent unwanted complications such as missed open fractures, urethral injuries and abdominal contamination. However pelvic surgeons should be directly asking all their patients about sexual and urological symptoms as part of wholistic care.”**

### Service Improvements

As we move to a more integrated national trauma service in the UK, there is enormous scope to improve our management of patients with pelvic fracture. The BOAST guidelines, highlight the need to identify early, those patients with GUI to prevent unwanted complications such as missed open fractures, urethral injuries and abdominal contamination. However pelvic surgeons should be directly asking all their patients about sexual and urological symptoms as part of wholistic care. The measurement of functional outcome is recommended by

TARN, the national trauma registry, and perhaps it is time pelvic surgeons worked to find national accepted scoring tools as a way to develop further research. We can also work towards better collaboration between orthopaedic and urology surgical teams. Perhaps we will see joint pelvic and urological MDTs becoming the norm in trauma centres.

### Conclusion

Issues of a sexual or urological nature cause immense distress to patients, and are commonly encountered in pelvic fractures. Men and women can encounter different problems due to the differences in pelvic anatomy. If we are to develop our understanding of this topic, we recommend auditing functional outcome as part of

patient care using gender and disease specific validated PROMs. The International Index of Erectile Function (IIEF) for male patients and the Female Sexual Function Index (FSFI) is the most commonly used tool for measuring sexual outcome.<sup>(4)</sup> Although no gold standard measures exist for measuring urological outcome, our institution regards the ICIQ – MLUTS and FLUTS as the most useful tool. ■

### References

References can be found online at [www.boa.ac.uk/publications/JTO](http://www.boa.ac.uk/publications/JTO).