Analysing Accident Statistics VI

Alan Gibson's series returns to examine the incidence of injuries to the spine and pelvis

Previous articles in this series have covered head, face, arm and leg injuries. Now it's time to discuss the area of the body that is the cause of great concern to the Flying and Safety Committee. I too am becoming increasingly alarmed by the frequency of spinal and pelvic injuries, most of which occur in paragliding rather than hang gliding.

We have been aware of this problem for some years, and designers have been working hard to develop back protection systems, but the incident reports just keep rolling in and I flinch whenever I read of another pilot with a compression fracture to the spine. Two things would make me think twice about continuing this sport: a fatality rate that exceeds my perceived risk level, and an unacceptably high incidence of back injuries - especially amongst experienced pilots who develop canopy collapses near the ground. If that sounds an emotive response, it reflects how I feel. At present I am happy to continue with my flying. But let me present the facts as we have them, gleaned from 1996 Incident Reports and the 1995 Paragliding Survey (see Part 1: July 1998).

Definitions

The spine (fig. 1) runs from the skull to the pelvis , and is made up of vertebrae, connected together by ligaments and fibrous intervertebral discs . The pelvis (fig. 2) is a strong bony ring, of which the sacrum provides the back portion .

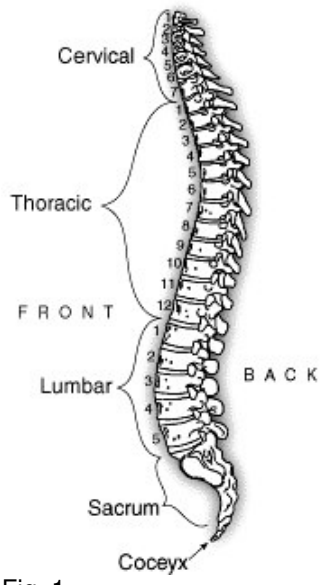


Fig. 1.

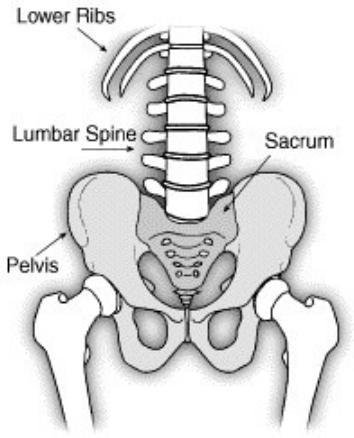


Fig. 2.

Spinal injuries may involve fractures or only the soft-tissues (discs, ligaments and muscles). Although the latter may not seem serious, they may be the cause of severe symptoms and limit full rehabilitation. A minor wedge fracture of the lumbar spine may recover faster and more fully than a soft-tissue injury.

Spinal fractures where the amount of damage doesn't threaten the overall bony structure are described as stable; major nerve damage is unlikely. More severe unstable fractures are at high risk of causing paralysis, which may or may not be reversible. In general, wedge-type fractures caused by axial compression of the spine in vertical deceleration incidents (as in paragliding) are stable and nerve damage is uncommon. More complex

fractures caused by additional side-impact and rotational forces are likely to be unstable. Unstable fractures that displace may result in spinal cord damage with paralysis; if they have not displaced they have the potential for displacement if the patient is not handled extremely carefully.

Types of injury
Injuries reported in 1996 were as follows:

	Paragliding	Hang gliding
Neck (soft-tissue)	0	1
Neck fracture	0	0
Thoracic and Lumbar (soft-tissue)	6	1
Thoracic and lumbar fracture	21	0
Coccyx fracture	2	0
Pelvic fracture	2	2
TOTAL	31 (in 31 pilots)	4 (in 4 pilots)

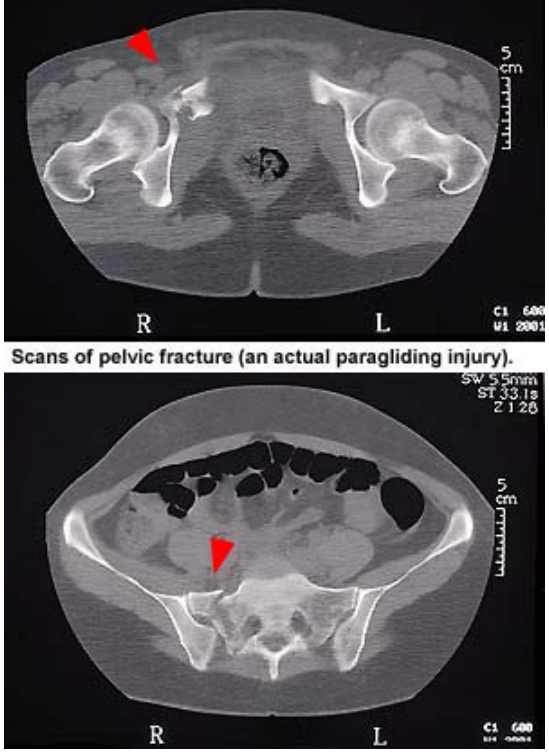
In paragliding there were 31 spine and pelvic injuries out of a total of 125 injuries (25%), the second most common region injured after the leg. In hang gliding there were only four injuries, out of a total of 47 (9%), the fourth commonest after arm, head, and leg injuries. The 1995 Paragliding Survey showed 47 spinal and ten pelvic injuries out of a total of 215 injuries (27%), again the second most injured area after the leg. Details of these injuries were as follows:

Neck (soft-tissue)	12
Neck fracture	1
Thoracic and Lumbar (soft-tissue)	7
Thoracic	1
Lumbar fracture	26
Coccyx fracture	0
Pelvic fracture	9

Of the 28 injuries involving vertebral fractures, 18 involved one vertebra, five had two, four had three, and one had four fractures. The commonest level for wedge fractures was the uppermost lumbar (L1) vertebrae . Only one injury (a lumbar fracture) was associated with paralysis, from which the pilot partially recovered.

Patterns of injury
Vertebral fractures vary considerably in their configuration. Most of those seen in paragliding are compression or wedge fractures (fig. 3). They are caused by upwards forces through the spinal column during a deceleration injury, and there are little if any rotational or angular elements. Similar injury patterns are seen in trauma from military aircraft ejector seat use. These injuries do not usually have nerve complications and are generally stable, unless a piece of the vertebral body has been pushed backwards into the spinal canal, risking spinal cord damage. This is an unusual occurrence with wedge fractures, hence the rarity of paralysis. A third of pilots with spinal injuries had other associated trauma. Commonly these were leg fractures, but there were also some injuries to internal organs.

Spine X-ray of paraglider pilot, side view, showing fractures of 2nd & 3rd lumbar vertebrae



Scans of pelvic fracture (an actual paragliding injury).

48% of the spinal injured pilots were experienced (Pilot or Advanced Pilot), compared to the rate for all injuries of 31% experienced pilots. With the caveat that the numbers are small and can't be heavily relied on, I will venture three reasons for the bias to experienced pilots: they may clock up more hours, exposing themselves to a greater cumulative risk; they may be flying in more challenging conditions, with a further associated risk factor; flying higher performance paragliders may increase the possibility of instability in flight. Pelvic fractures can range from simple cracks to major and life-threatening injuries (fig. 4). Eight of the ten pelvic injuries occurred during the flight phase. The mechanism of injury is a sideways force with or without shearing, such as when the body hits the ground obliquely in a paragliding harness.

First-aid

If a pilot is unconscious, assume he has a neck and/or spinal injury. Any pain in the neck or back may represent a spinal fracture. If in doubt, treat assuming the worst and you won't go wrong.

If conscious, find where any pain is, and can he move all limbs. Absence of paralysis doesn't exclude an unstable fracture, so it is all the more vital to handle the patient correctly, or a patient without nerve injury could become one with paralysis - a tragic outcome from a preventable complication. There is no way of telling whether someone has a stable fracture, an unstable fracture or just a soft-tissue injury, so don't be fooled by the level of pain, etc. Again, assume the worst scenario, even if subsequently it turns out that the injury wasn't serious. I once attended an injured pilot who, with assistance, was able to walk off the hill. I didn't call a helicopter; the result was an agonising evacuation to an ambulance, plus a long road journey, for what eventually turned out to be a lumbar wedge fracture. Looking back, I wish I had called up air-rescue. Make sure you don't make the mistake I did.

Check for other injuries. Don't remove a helmet unless it is essential for reasons of breathing, etc. If is necessary, it is a two-man job: one person keeping the head and neck still, the other easing the helmet off gently.

Don't move the patient until expert help arrives unless it is absolutely essential. If it is necessary,

'log-rolling' must be used, with several pairs of hands supporting the neck and back during the manoeuvre. Log-rolling and helmet removal are best learnt on a first-aid course, or at least by studying descriptions and illustrations in a first-aid book.

Consider what sort of evacuation is needed. As already stated, calling out air rescue is fully justified by these injuries, with the risk of appearing overcautious if it turns out to be less serious. Unless there are other associated injuries, most back injuries will not come to great harm by waiting for trained rescue personnel to arrive. This is preferable as the evacuation of these patients must be done correctly.

The neck should be placed in a hard protective collar and the back on a hard spinal board or stretcher. I recently tested a 'vacuum stretcher' called the Evac-U-Splint on a patient with a pelvic fracture. It provided stable support for spine and pelvis for five days in hospital and during evacuation to UK. I recommend that all training schools and competition events should have one of these devices available.

Pelvic fractures are serious since they can cause severe internal bleeding or organ damage, so in this case too evacuation should be considered as urgent.

Hospital treatment
Spinal injuries. X-rays will show the extent of any fractures, but a CT or MRI scan will demonstrate this much more graphically. The injury is assessed for stability. If unstable, surgery may be advised to stabilise the spine, which may involve transfer to a specialist unit. If surgery is not needed, then a period of bed rest, with or without traction, may be needed. After that, mobilisation is started, with or without external support from a neck brace or spinal jacket. Patients with paralysis will usually be transferred to a Spinal Injuries unit for assessment and rehabilitation. They may also need surgery to stabilise the spine, particularly if the paralysis is only partial and therefore potentially reversible.

Pelvic fractures. Less severe fractures are treated with bed rest until the pain subsides enough to mobilise. More severe injuries may need surgical stabilisation to reduce pain and bleeding, and to restore anatomy. This may be done with an external fixation frame, and in some cases the addition of plates and screws. Damaged internal organs may need urgent surgery.

Recovery
All pilots in the Paragliding Survey with pelvic or spinal injuries were able to return to work, times varying between one and six months (average: three). 40% of each group (spinal and pelvic injuries) did not return to paragliding. Of the remainder, those with spinal injuries were usually back flying by four months. The earliest was a well-known pilot who went out and flew the next day - quite mad, and I know who you are! Pelvic injuries took longer to get over, ranging from five to 30 months and averaging 14 months before returning to flying.
A reasonable time to return to flying will vary depending on the severity of the injuries, as outlined above. With a single, moderate wedge fracture of a lumbar vertebrae I would recommend six months as a reasonable time to aim at, but that should be shortened or lengthened according to severity. With a pelvic fracture it is likely to take a year or more before you can take to the air with any reasonable safety. As always, consult your friendly orthopaedic surgeon for his views on your individual case.

Prevention
You probably wondered if I would ever get round to it! To tantalise you a bit longer, I'm not

going to deal with it personally at all for two reasons. As there's a lot to cover in terms of back protection, glider design and pilot training a whole article is required, and as I'm not an expert in this area I would prefer someone with greater knowledge of the subject to contribute. Andrew Bucknill has agreed to be next month's guest writer. He and I have worked together researching the BHPA statistics, Andy has also been involved in testing back protectors and is currently training as an orthopaedic surgeon. Who better to head up this important article?

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