

- Monitoring of the fetal heart rate as appropriate.

### Conclusion

After injury in pregnancy, the key to a successful outcome for both mother and child is prompt and adequate initial resuscitation of the mother.

All patients with major trauma should be kept under observation for at least 24 hours.

They should be referred to an institution where they can benefit from a multi-team approach. Careful fetal monitoring is essential once fetal viability has been established.

Resuscitation of the mother may save the baby. There are times when the mother's life is at risk and the fetus may need to be sacrificed in order to save the mother. If resuscitation of the mother fails, urgent perimortem caesarean section may be useful with short CPR times.

## CHILD RESTRAINT — HOW WE DO IT!

**GRAEME J PITCHER, MB BCH, FCS (SA)**  
**Senior Specialist and Adjunct Professor:** *Division of Paediatric Surgery, Johannesburg Hospital and University of the Witwatersrand, Johannesburg*

**TIMOTHY N ROGERS, MB BCH, FCS (SA)**  
**Fellow in Paediatric Surgery:** *Division of Paediatric Surgery, Johannesburg Hospital and University of the Witwatersrand, Johannesburg*

Consideration for the safety of child passengers in motor vehicles is relatively recent. Only in the last 20 years has the necessity for child restraint in vehicles been recognised and effective devices become readily available. Most of today's medical practitioners were probably transported without restraint devices as children. In South Africa, the implementation of child restraint systems in vehicles has been

woefully slow and is further hampered by absence of appropriate enforcing legislation. Further complicating the situation is the rapid development of very sophisticated safety equipment aimed at protecting adult occupants from injury in the event of a collision. Air bags, in particular, have been shown to reduce the severity of injury to a correctly restrained adult passenger but are potentially lethal to infants and children who are in their proximity when they deploy and cause a now well-recognised pattern of injuries.<sup>1</sup>

Motor vehicle accidents are the leading cause of death among children older than 1 year. Seventy per cent of these fatalities occur in unrestrained children. The risk of death and non-fatal injury are markedly reduced in children who have been appropriately restrained.

It is the duty of all health care practitioners to provide accurate advice about child restraint to their patients. We describe practical guidelines for age-appropriate child restraint devices for those who are responsible for transporting children.<sup>2</sup>

### INJURY PATTERNS

Injury patterns related to the incorrect use of restraint equipment are now well recognised. Ejection is the most dangerous scenario and is associated with a dramatic increase in mortality<sup>3</sup> and severe injury, especially of the head. Other recognised injury complexes include:

#### The lap belt complex

This is caused by rapid forced hyperflexion of the upper torso against a fixed lower lumbar spine. Components are the following:

- typical transverse bruising of the belt over the lower abdominal wall
- bowel injury, typically to the duodenojejunal junction or other points of retroperitoneal fixation
- flexion — distraction injuries of the lumbar spine.

#### Air bag injury complex

Air bag deployment can cause severe injury, especially to young children.

The most dangerous scenario is the rear-facing infant in the front seat of a vehicle equipped with a passenger air bag. In this situation the air bag fractures the rear headrest of the child seat, often causing fatal head and neck injuries. Other typical air bag injuries are e.g. cervical spine injuries,<sup>4</sup> including atlanto-occipital dislocation, and blunt facial and thoracic injuries.

### Forward-facing infant injury complex

In this situation the infant tends to sustain rapid and severe cervical flexion and 'submarines' under the harness straps. Typically, head and flexion cervical injuries occur with liver and spleen injuries due to subcostal pressure of the harnesses.

### CHILD RESTRAINT RECOMMENDATIONS

Unlike the restraint systems used by adults, which are usually standard fittings, those required by children are usually purchased separately and must be installed by the owner. Also, unlike adult restraints where 'one size fits all', different restraint devices are required for children of different ages and sizes.

The purpose of any restraint system is to prevent ejection of the occupant from the vehicle and to minimise contact with the vehicle's passenger compartment in the event of a crash. Forces are distributed widely over the body's anatomically strongest components.

#### Below 10 kg

The child should always face the rear of the vehicle, secured in an appropriately sized car seat. Neonatal inserts are available to comfortably house even the smallest baby. These can be removed as the child grows. The seat should be tilted at an angle of 45° to ensure that the baby's head is adequately supported and that the forces are directed through the baby's back.

#### Above 10 kg

The child must be restrained in an appropriate car seat and may face

forward. The child should remain in the seat until s/he no longer comfortably fits (at approximately 20 kg, depending on the seat) at which stage one may progress to a booster seat.

**The booster seat**

Seat belts fitted to vehicles are designed for the average adult. If fitted to a child, the diagonal component tends to cross the neck and the transverse or lap component lies across the abdomen. This poor skeletal support causes abdominal and back injuries. In the worst scenario, the child may be ejected or flung from the seat.

The commonly available booster seat is the 'belt-positioning booster' which elevates the child to provide a better safety belt fit. In addition to offering far superior crash safety it enables the

child to see out of the window, further enhancing compliance.

Once the child can sit safely in a conventional seat equipped with a seat belt, s/he may graduate from the booster seat. The feet should rest comfortably on the floor and the sacral area should fit snugly in the angle of the seat. The seat belt should cross the chest wall over the clavicle. A child under the age of 12 years should not occupy a front seat position, especially if the seat is fitted with an air bag. Never put a seat belt around two or more children.

It is very important to check the following:

- That the seat is well secured to the vehicle.
- That the harness straps are correctly adjusted for the size of the child,

fitting at or below the level of the shoulders. These must regularly be re-adjusted as the child grows.

- That the child's mass is accommodated by the safety specifications of the seat.
- That the correct forward- or rear-facing chair is used.

**CONCLUSION**

Many South African children are injured owing to failure to use restraint systems correctly. The burden on the child, family and community is enormous and the parental guilt often intolerable. This calamity can and should be avoided. Promote child safety in your family and circle of friends, and in your practice and community. All children should be secured at all times.

*References available on request.*