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CLINICAL PRACTICE

Emergency care of the trauma patient in remote regions of Papua New Guinea

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SUMMARY

The purpose of this article is to discuss 'best practice' regarding the management of a trauma victim's upper airway in a remote region of Papua New Guinea (PNG). This article has been written with the trauma patient in mind; however, much of the information would be equally relevant to the acute and chronically ill patient. Therefore the management described should be of use to aid post orderlies, community health workers, nurses and doctors alike who work or patrol in remote regions of PNG. The article is designed to take the reader through a step by step approach. Commentaries to further clarify or expand the text are placed at the end of the article under specific addendum headings, so as not to disrupt the main flow of the subject matter. In addition to upper airway management, this article also details 'ideal' emergency trauma equipment and drug requirements for bush use.

Introduction

Many factors besides those concerned directly with medical care should be considered before patrolling in remote areas. These include one's fitness and ability; types of terrain, climate, season; distance to the nearest medical facility; approximations of time needed to evacuate a casualty over varying types of terrain, often using an improvised stretcher; local available resources; rescue service capability, if any; effective communication systems, if available; and contingency plans. If the health provider is aware and prepared regarding these issues then the survival chances of a trauma victim are greatly improved. Advance contingency preparation is vital for most traumatic eventualities, if one is to achieve a successful outcome for the casualty.

In this article the proposed management will be relevant, broadly speaking, to any condition such as an injury, wound or illness, whether sudden or long-term, that is or becomes life-threatening, in which immediate first aid management is required in order to arrest or improve the casualty's deteriorating state. This is always the main aim, until safe evacuation can be undertaken, so that the casualty can receive more appropriate and sustained care at a medical facility.

Trauma equipment and drugs

Whilst in an ideal world equipment and drugs should be carried to cope with most eventualities, it is obviously not practicable to achieve this whilst working and patrolling in the bush.

Detailed below are basic equipment and drug item lists for bush trauma use. They are in no way definitive lists. You will have to make alterations depending on local constraints and conditions and available medical resources etc. It is also important to have an appropriate medical kit-bag which should have the following qualities: durable, padded, robust, weatherproof and easily carried. In all probability it will not be possible to obtain all the recommended equipment. However, do your best and improvise where possible.

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Recommended trauma equipment pack items

- Sterile gloves (several pairs)
- Airways (nasopharyngeal with safety pin, oropharyngeal and paediatric airways)
- Large bore cannula/venflon x 3 (for chest decompression)
- Large padded sterile wound dressing x 3
- Small padded sterile wound dressing x 3
- Sterile swabs/normal dressing (several)
- Tourniquet and compression bandages
- Drip set: to include venflons x 4, giving sets x 2, Haemaccel colloid solution 500 ml x 2, Hartman's electrolyte solution 500 ml x 2 (or equivalent solutions available; carry more if possible but weight is a major factor here), adhesive skin tape, alcohol swabs
- Cricothyroid set (tracheostomy tube, endotracheal tube or improvised item such as a modified 2 ml syringe)
- Povidone iodine solution or equivalent
- Chest drain set (if available)
- Asherman chest seal (or improvised item)
- Basic mucus extractor kit for removal of blood or other fluids from the throat (or improvised item)
- Nasogastric tube with 50 ml syringe
- Foldable multipurpose neck collar or improvised item
- Laerdal pocket mask (or equivalent item)
- Stethoscope
- Small sharps bin/container or improvised item
- Small durable torch, including spare batteries and bulbs; the ideal is a torch that can be secured around the head to allow for hands-free operation.

Recommended trauma drug list (plus required syringes and needles)

- Opiates (including appropriate antiemetic and reversal agent)
- Antipyretics/analgesics (non-opiates): aspirin, codeine, paracetamol
- Adrenaline (1 in 1000 intramuscular)
- Antihistamines
- Hydrocortisone
- Local anaesthetic (LA): lignocaine/ bupivacaine
- Anti-inflammatories (Ibuprofen)
- Antibiotics
- Ventolin inhaler
- Sterile water ampoules
- Injection needles (various sizes)
- Syringes (various sizes).

Note that certain medications can be applied intravenously (iv) via venflon cannulas if in situ. Clean drinking water is also an important item to carry.

Drug usage notes

Considerations for the carriage and use of drugs in the bush are their appropriateness, availability, durability and longevity and the ability of the individual administering the drug. This person must be competent in all aspects of drug administration. A saying to bear in mind concerning emergency drug use is – *stress dispels knowledge* – that is to say in a sudden emergency situation, stressful events may cloud one's resolve or ability to carry out mental tasks quickly and accurately. It is important to prepare for this eventuality.

Drugs should be organized and grouped for efficient and safe use. Ideally have basic (weatherproofed – laminated if possible) drug treatment cards made. These cards should contain the following information:

– correct dosage to be given for a specific ailment or condition (adult to paediatric dosages)

– information on how to reconstitute and administer (iv/im/oral etc)

– contraindications

– known hypersensitive reactions to watch for and appropriate actions

– associative drugs (for example, opiates should be accompanied by antiemetics and naloxone, the opiate reversal agent).

Remember a patient may be on drugs that react to other prescribed drugs, or have specific drug allergies. Therefore, before you give any medication always endeavour to find out the person's current drug regimen and allergies – do not make the situation worse.

Paediatric prescriptions

Regarding paediatric medications for young children, never assume that a minor is a small adult. Infants and young children respond to medical drugs in a different way to adults. Their bodies are still developing, so they are less able to tolerate high dosages. They require smaller and more accurate dosages. Their medications are often made up as special preparations such as a syrup to disguise a bitter taste. It is important that parents are instructed in how to give the correct dosage and understand that the child must complete the full course of the medication, even when he or she appears to have recovered.

Primary survey of the casualty

When conducting the primary survey, checking for airway patency is the immediate priority. If the airway is occluded the casualty will quickly suffer from hypoxia (loss of vital oxygen replenishment to the body tissues). Total occlusion of a casualty's airway will prevent lung function and quickly lead to irreversible brain damage and death. Three to four minutes is usually the available window to correct matters.

Upper airway obstruction (nose to larynx) can result from the following causes:

1) trauma affecting the airway passage, often with accompanying bleeding and oedema;

2) injury to the brain or nerves which control the upper airway – this can result in the casualty having an altered level of consciousness and losing both muscle power and protective reflexes;

3) aspiration of food or stomach contents;

4) oedema from smoke inhalation or allergic reaction.

The approach

Approach an unknown situation with caution. Look for any further potential dangers. Do not become a casualty yourself needlessly. Try to obtain a history of events by asking questions from persons in the vicinity or from the casualty if he or she is conscious.

Use available assistance and resources if required and keep a good perspective on the situation regarding any potential or dangerous ongoing activities. You may first have to remove the casualty to a safer environment, which must be undertaken as carefully and quickly as possible, before any medical treatment can be given. Keep calm; sometimes the most traumatic looking injuries are the easiest to treat.

The assessment

It may be obvious as to the nature of the problem. The person may look flushed, in a state of alarm and groping at their throat. The classical signs of choking due to an upper airway blockage are set out in the Addendum, 1.1 Management of a choking casualty.

On the other hand the person may appear still and lifeless. Look for any unusual outward details such as maxillo-facial injuries or disfigurement, unusual skin discoloration (eg cyanosis), blood or body fluids on the ground or clothes, etc.

If you suspect a spinal injury – especially concerning the cervical area – ensure that the head is correctly aligned and fully supported to prevent further injury. In any case, if unsure, manage the casualty as a spinal injury.

Speak to the person to try and elicit a response; for example, "I am medically trained. Do you need help?"

If there is no verbal response, see if you can get a response to touch. Put your hand on a respectable part of the body such as the

person's shoulder and give a shake. If still no movement pinch their ear or rub your knuckle down their sternum. This should give you an idea of the state of the person's consciousness.

Management of the airway

If there is no or very little response, safely position the casualty so that they are lying on the ground in the supine position Kneel beside the casualty and place your head just above theirs. Turning your head and looking down towards their chest, *look, listen and feel:*

– *Look* for any perceptible rise and fall of the casualty's chest.

– *Listen* with your ear close to their nose and mouth for any breathing sounds.

– *Feel* with your hand placed on the casualty's chest and abdomen for any detectable breathing movements, or any perceptible exhaled airflow against your cheek.

Note all three actions can be undertaken concurrently. It is important to assess as soon as possible whether the casualty has stopped breathing. If upon approach the casualty is in the prone position you will have to turn them over into the supine position to be able to carry out the above. Do not forget if they have a suspected spinal injury that they must be turned gently under control using correct head alignment. Note that children require specialized care for their management (see the Addendum, 1.2 Paediatric airway management).

If there is no response whilst the patient is in the supine position open their mouth. Conduct a sweep of the upper throat with your fingers to try and dislodge and remove any debris that may be in the throat, while undertaking a head tilt and chin lift manoeuvre.

A head tilt and chin lift, or similar manoeuvre such as a jaw lift, will free up the tongue if it is the cause of airway occlusion and the patient may start to breathe again. This is because an unconscious patient's tongue may often drop back and together with vomit or throat matter block off the airway channel. Correctly repositioning the head will stretch the tongue muscle away from the back of the throat and prevent this happening (Figure 1).

Breathing may then commence again but the patient may still be unconscious. This is the time to consider the use of an available adjunct to maintain the patient's airway (see the Addendum, 1.3 Adjuncts – artificial airways).

Still no improvement? Start to manually ventilate the patient using your own breath. This can be carried out by either pinching the patient's nose and breathing through their mouth – having formed a seal with your own mouth – or through an artificial breathing device that interposes between the patient's

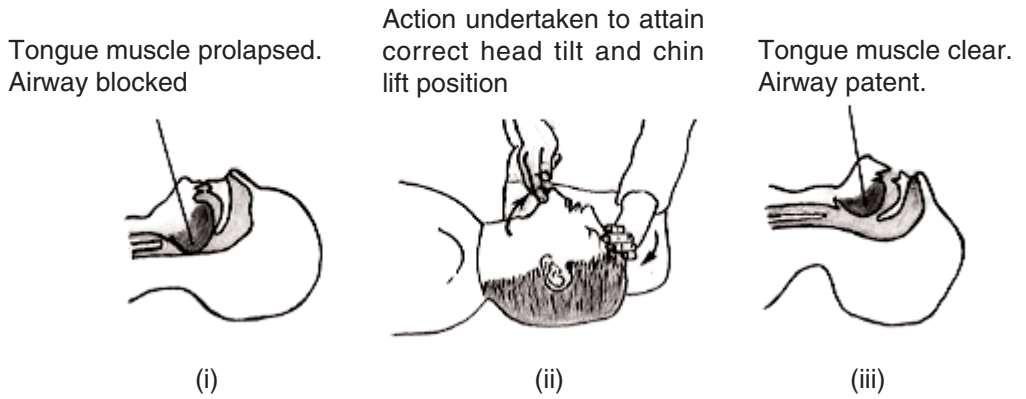

Figure 1. (i) Unconscious casualty – depicted with occluded airway (midline sagittal section view of head and neck).
(ii) Unconscious casualty – head tilt and chin lift manoeuvre (sketch representation).
(iii) Unconscious casualty – depicted with patent/unobstructed airway (midline sagittal section view of head and neck).
Figure based on drawings from First Aid Manual (1).

mouth and your own whilst maintaining a good seal. This is preferable, to avoid the associated risks of cross infection and contamination. Alternatively the mouth can be sealed and artificial breathing commenced by blowing down the nasal passages (see the Addendum, 1.4 Cardio-pulmonary resuscitation considerations, and the section in the main text on p229 on management when the upper airway is patent).

It is important to establish if the patient's airway is responding to your manual breaths, and that their chest is rising and falling in synchrony with your ventilations. If their chest does not rise and fall the airway is still obstructed. Quickly reassess your ventilation technique. Check the patient for correct head positioning and airway seal and that ventilations are adequate and proportionate. If after trying to ventilate the patient a second time you are still unable to do so and you have carried out all the appropriate actions for a suspected upper airway blockage, a surgical cricothyroidotomy procedure must be performed (see the Addendum, 1.5 Cricothyroidotomy clarification).

Cricothyroidotomy

A cricothyroidotomy is an emergency surgical procedure which normally results in two neck incisions (one through the skin and one through the underlying cricothyroid membrane – often performed as one action) in order to make an opening into the underlying trachea. The anatomical site of incision is in the midline, directly below the level of the thyroid cartilage. The aim of this procedure is to create a patent artificial airway passage by the use of an appropriate adjunct. The procedure bypasses the upper airway obstruction and restores adequate life-saving oxygen in sufficient quantities to maintain adequate tissue saturation.

Cricothyroidotomy - equipment and preparation

Equipment should include:

- Pair of sterile gloves
- Ground sheet (or equivalent)
- Povidone iodine solution (or equivalent)
- Tracheostomy tube 5-6 mm for adults (or improvised device – 2 ml syringe) and 3 mm for children over 12 years old
- Artificial airway filter/humidifier (or swab)
- Syringe for inflation of tracheostomy tube cuff if relevant
- Lubrication
- Scalpel with blade size 10 or 11
- LA (lignocaine, with 10 ml syringe and required needles)
- Forceps/haemostats (if available)
- Improvised suction – 50 ml syringe with tube for insertion into airway device.

It is important that you prepare and lay out all necessary equipment on as clean and sterile a surface as possible whilst using the best aseptic technique that the situation allows.

Preparation should include the testing of the tracheostomy tube cuff before use. However, do not worry if you do not have a tracheostomy tube. Improvise by using any appropriate rigid or semi-rigid tube such as a 2 ml plastic syringe, or, in dire emergency, whatever is to hand.

The procedure for preparing a syringe for use as an improvised tracheostomy tube is as follows. Take out the plunger and keep for future use. Slice through the remaining syringe barrel at an approximate 45 degree angle, two-thirds along its shaft, whilst moving away from the apex. Now keep the portion with the flange on. This will be used as an improvised tracheostomy tube (Figure 2).

Cricothyroidotomy – procedure

- Position patient to be supine, with shoulders raised so that the neck is hyperextended to facilitate easier location of the cricoid membrane. Management of spinal injury, even if it is suspected, must be secondary at this time.
- Have all necessary equipment laid out.

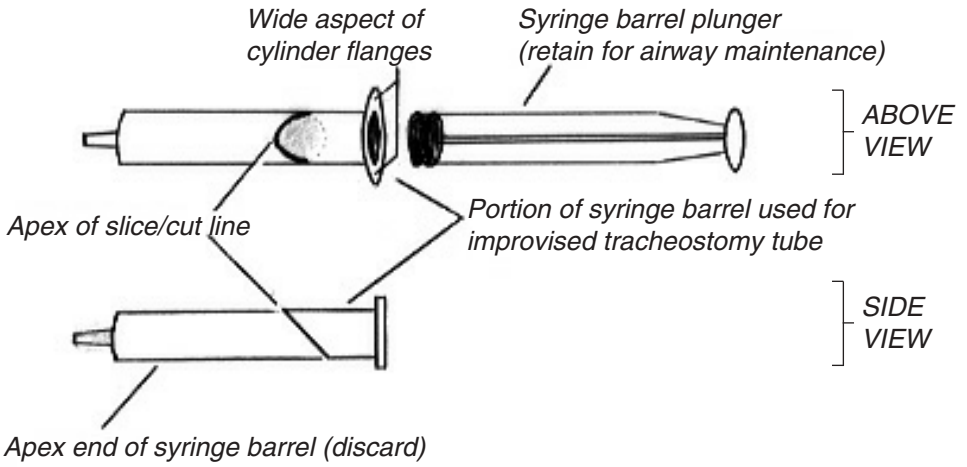

Figure 2. Drawing depicting the procedure for syringe barrel conversion into an improvised cricothyroidotomy device (tracheostomy tube for artificial airway).

- Put on surgical gloves.
- If for any reason you suspect that the patient may go into shock, due to impending circulatory volume loss, pre-operatively carry out a precautionary cannulation (if there is time), in case fluid infusion will be required.
- Clean the skin from the sternal notch to chin and laterally to base of neck using betadine scrub or available alternative *(*if time allows, which it usually does not*).*
- Locate the cricoid membrane. This is located between the thyroid cartilage and the cricoid cartilage (Figure 3). The easiest landmark is the Adam's apple (thyroid notch). To locate the cricothyroid membrane, place a finger on the thyroid notch and slide the finger distally to the groove below.
- Anaesthetize the tissues running adjacent and parallel to the trachea, superior and inferior to the intended scalpel insertion point, using a 10 ml syringe with 25-gauge needle and a 1% or 2% lignocaine solution (if time allows, otherwise disregard).
- Tense the skin and stabilize the larynx with the non-dominant hand. Using a No 11 scalpel blade make a transverse (horizontal) incision through the overlying skin above the cricothyroid membrane 3-4 cm in length.

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- Identify the underlying membrane and then continue the incision through it, approximately 1 cm on each side of the midline. A hissing sound may be heard as you penetrate the wall of the trachea.
- Enlarge the opening by using available clamps or artery forceps or inserting and rotating the end of a scalpel handle through 180°. If available, the use of curved artery forceps is ideal for keeping open the artificial passage made.

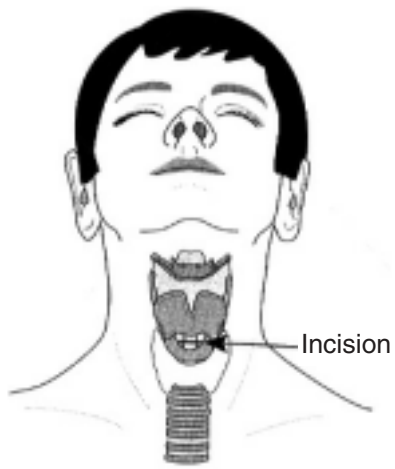

Figure 3. Sketch diagram depicting anatomical location and incisional area of cricothyroid membrane. Figure based on Figure 3-34 in Essentials of Immediate Medical Care, 2nd edition (2:70).

- While keeping the forceps in position slide in the lubricated artificial airway (tracheostomy tube with introducer or improvised syringe), so that the distal end of the hollow tube projects towards the lungs allowing unimpeded airflow from the lungs to the outside atmosphere and vice versa. (This may sound logical but it has been known for professionals to wrongly insert cricoid devices so that the distal end of the tube projects towards the mouth causing the patient to die due to the lack of air flow and oxygen replenishment). Auscultate to ensure airflow is entering the lungs.

- If inserting a tracheostomy tube with an introducer, remove the introducer immediately when in situ and inflate the tube cuff whilst checking for airway patency (do not throw away the introducer). If using an improvised syringe barrel, while stabilizing the larynx between your fingers, insert the cut end of the syringe through the surgical opening at right angles to the trachea so that the most distal part of the syringe bevel (its point) is uppermost in the trachea towards the patient's head while the bevelled opening slopes downwards and away from the syringe point and faces towards the chest (Figure 4). Once again check for patency of air flow (look, listen, feel).

- Secure device as well as possible with tape or strapping.

- Attach airway filter/humidifier. If unobtainable improvise. Secure a piece of swab material around the artificial airway opening and occasionally drip some clean water on to it. The swab provides a degree of filtration preventing contaminants such as vegetable matter, dust or even small insects from entering the open airway. The water helps humidify the air intake as the nasal passages would have done.

- The introducer device used earlier can prove to be useful later to clean the tracheostomy tube if it starts to get respiratory products building up on it. Similarly if using an improvised syringe device the plunger can be used for this purpose.

- Local analgesia 1-2 ml sprayed down the tube will probably induce the patient to cough for a while, but then this will help provide relief for several hours.

- The 50 ml improvised suction device can also be used for collecting waste products such as fluid or blood intra- or post-operatively.

Management when the upper airway is patent (unobstructed airflow)

The cricothyroidotomy procedure is a procedure of last resort. There is no need to undertake this procedure if when ventilating the patient you observe that their chest rises

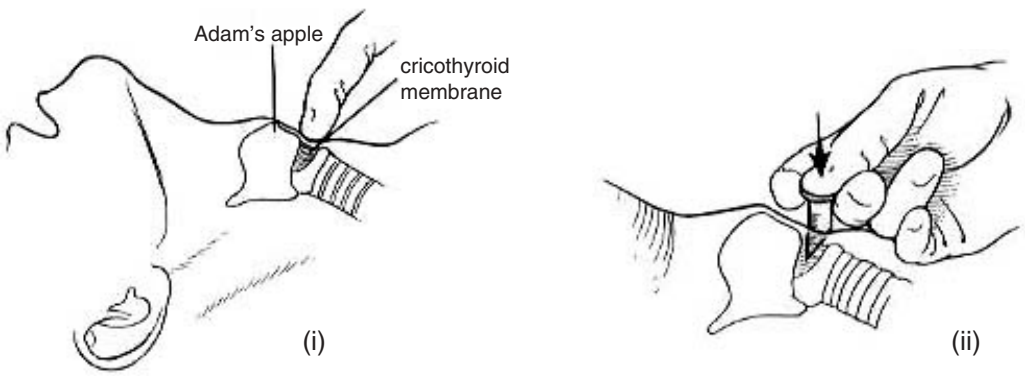

Figure 4. (i) Sketch diagram depicting the correct anatomical alignment of the patient's neck, pre- and post-operatively. Figure based on a drawing in Field Guide to Wilderness Medicine (3:47).
(ii) Sketch diagram depicting the insertion of a modified syringe barrel into the patient's tracheal passage, post-operatively. Figure based on a drawing in Field Guide to Wilderness Medicine (3:49).

and falls adequately in synchrony with your own breaths. Then you have a patent airway. After two initial ventilations you must briefly stop and check the patient's carotid neck pulse. This is the most prominent and locatable arterial blood vessel on an adult used for resuscitation purposes; on a young child it is the brachial artery.

One of three common scenarios can then happen:

1) *The patient may start to breath on their own accord but will need to be closely monitored.* If advisable, turn them into the 'recovery position' (provided no other medical action is needed after performing a secondary examination). The so-called recovery position is used to stabilize the body, allow for a certain amount of unimpeded chest movement and facilitate a corridor – with the help of gravity – for the flow of body fluids such as vomit which may contain blood or gastric fluid that will need expelling to enable the airway to remain functional. In fact at the first sign of vomiting an unconscious patient must be rolled on to their side with head lowered. The patient must be held in this position until vomiting has stopped and the vomitus cleared from their mouth.

   On no account allow vomited matter to be aspirated by the patient. To do so could easily allow the aspirated material to enter the patient's lungs with serious consequences.

2) *The patient may have a pulse but is unable to breath independently.* They will need immediate, sustained artificial ventilation (about 12 breaths per minute). In time, however, there is a possibility that they may fully recover their independent lung function and resume breathing without assistance. Therefore reassess at regular intervals (about every 3 minutes): stop ventilating and check for a continued pulse and whether independent breathing has resumed.

3) *No circulation is detected.* Commence manual cardiac compressions (about 60 per minute) immediately interspersed with chest ventilations. For an adult 15 chest compressions are alternated with 2 rescue breaths; even if there are two first aiders this ratio is now preferred to the old one of 5 chest compressions alternating with 1 ventilation. This procedure is termed cardio-pulmonary resuscitation (CPR).

   Continual reassessment must also be undertaken at regular intervals when carrying out CPR to check and establish if the patient's circulation or breathing has returned. If so the patient can then be placed into the recovery position with vital signs monitored at regular intervals. However, if a relapse does occur immediate and vigorous efforts in CPR need to be resumed in order to save the patient's life.

Conclusion

Although airway management is a specialized area of medical knowledge, this should not deter the competent first aider or a health professional from performing basic life-saving techniques in an emergency situation in order to save a life. This article on emergency bush trauma is written with this in mind. Personnel trained in first aid and other health professionals are also advised to broaden their knowledge on this subject by further reading and exposure to good professional practice.

Note that certain medical books in circulation may differ on certain technical aspects regarding 'procedural doctrine'. This is partly due to ongoing developments in this medical discipline, as 'best practice' is modified from time to time as improvements are incorporated into the medical literature. With this in mind this article lists a bibliography of relevant publications (1-10).

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Addendum

1.1 Management of a choking casualty

A common cause of respiratory obstruction in adults is the aspiration of food. Alcohol consumption is often associated with such events. Large food fragments can also get trapped in the larynx due to impaction. This can completely block off the air passage.

Determine if the cause is due to sudden entrapment of food while eating. The main outward sign to observe is the look of distress on the person's face. The hand raised to the throat is the classic tell-tale sign while they make frantic attempts to free the obstruction. After a brief struggle they will collapse if the obstruction cannot be cleared. Note that this type of airway obstruction is a true emergency and will require prompt action by the first aider to save the casualty's life.

Attempts to dislodge the food by inserting a finger or available device are rarely successful and may further complicate matters by forcing the food further down the throat.

The first line of action in the initial stages of choking is to get the patient into a sitting position and endeavour to have their upper body bent forward so that their head is lower than their throat to enable gravity to assist. Then administer forceful back-slaps between the patient's shoulder blades to try and dislodge the offending matter. Note if the head is not lower than the throat the matter if loosened may lodge further down. This method should only be tried briefly and usually no more than four or five back slaps should be given to try and free the offending obstruction whilst the patient is in the head-down position.

If unsuccessful the next course of action is to administer the 'manual thrust' (also called the Heimlich manoeuvre). This procedure is designed to force the patient's diaphragm upward forcing air out of the lungs. This action often pops the obstructing food or object out of the larynx. It has also proved to be very effective in ejecting smaller objects that do not fully occlude the airway such as aspirated pills.

To administer the Heimlich manoeuvre on a conscious patient the patient should be standing and the first aider should position themselves behind the patient and extend their arms round to the front. With one hand a fist should be made which is tucked just below the patient's sternum into the inverted V area bordered superiorly by the distal end of the sternum and then bilaterally by the rib cage structure as it forks. The other hand is then placed over the fisted hand. With a sudden violent motion both hands are thrust in unison 'inward and upward' as sharply as possible. Several attempts may be required to expel the food. When undertaking this procedure avoid putting any undue pressure on the ribs although some may be unavoidable. Note: squeezing the ribs does not expel items, thrusting against the diaphragm does. In a few cases undue rib pressure has resulted in multiple rib fractures.

If the patient is unconscious or obese place them on their back on the flattest surface available. The first aider should then straddle the patient and place both hands, one on top of

the other, on the upper abdomen just below the sternum. The action is to press firmly downward towards the back of the abdomen and upwards towards the head of the patient. This action is also intended to force the diaphragm upwards and to dislodge the offending obstruction.

If the Heimlich manoeuvre or abdominal thrusts are not successful after several tries, a cricothyroidotomy procedure must be performed immediately.

1.2 Paediatric airway management

See also 1.3-1.5. Infants (under 1 year) and children (1-7 years) have a tendency to put many and varied objects into their mouths that can cause the throat to block. A child's throat is very delicate and can be easily damaged. There are many ways in which they are managed differently to an adult. The first aider must be aware of these differences and must know the appropriate management if given the responsibility of caring for such age groups. For example, back slaps for older children are contraindicated by most authorities, manual thrusts or abdominal thrusts being the preferred first-line procedures.

1.3 Adjuncts – artificial airways

It is normally good professional practice to insert an artificial airway when attending to an unconscious patient, unless contraindicated by obvious circumstances. The two most common airway devices carried for field or bush use are the oropharyngeal and nasopharyngeal airways. Both airways are designed to prevent the tongue from prolapsing into the oropharynx (back of throat), whilst keeping the upper airway patent. However, neither device provides complete airway protection as the patient may still aspirate their own vomit or blood and block the airway.

The oropharyngeal airway comes in a variety of sizes ranging from 0 for neonates up to sizes 3 and 4 for adults. The correct size is selected by measuring the airway's length from the patient's jaw angle or ear lobe to their mouth for an approximation of the size required.

Note that the insertion technique is different for a child to that for an adult. For an adult the airway is inserted with the concave surface facing uppermost until the posterior aspect of the patient's hard palate is reached. The airway is then rotated 180 degrees and fully inserted posteriorally. The procedure is aided by carrying out a head tilt and chin lift manoeuvre at the same time. This action stops the tongue from collapsing backwards into the oropharynx. However, the oropharyngeal airway is only tolerated by a deeply unconscious patient and if used inappropriately it will cause the patient to gag and reject the airway and may even induce vomiting. Inserting the device into a child is simple as the device is inserted straight in with the concave surface facing downwards with no rotation needed. As with an adult, insertion can stimulate the coughing reflex and raise intracranial pressure. It can also block the ejection of vomit or other collected matter.

The nasopharyngeal airway is the preferred airway (adult use only) as it has the major advantage over the oropharyngeal airway of being better tolerated in the semiconscious patient. The size of the tube chosen can be easily estimated as it is comparable with the patient's little finger. The usual sizes for adults range from 6 to 8 mm in diameter. The length of the airway increases in proportion to its internal diameter size.

Before inserting the tube it should be lubricated on the outer surface around the entry point to enable smooth access. A safety pin should also be inserted into the tube's flange at the opposite end. This prevents the airway from slipping down the nasal passage. Upon insertion of the tube the patient should be in the supine position with the tube's bevel end facing downwards. A slight twist is often helpful when inserting the tube but the tube must never be forced up the nasal passage as severe bleeding may result. One other complication may arise if the tube is too long as this may cause vomiting or laryngospasm by stimulating the larynx.

The nasopharyngeal tube is contraindicated for infants and children up to the age of 10 years. Their upper airway anatomy is different to that of an adult and cannot accommodate this device. Children have proportionally

much larger adenoids than adults and trying to insert a nasopharyngeal device can easily cause major haemorrhaging.

If no artificial airways are available and the patient needs to be moved by stretcher some distance whilst unconscious, a large safety pin can be used to pierce the distal aspect of the tongue near its apex. A piece of cord can then be attached to the safety pin and secured to an item of clothing further down on the patient to keep the tongue away from the rear of their throat and so avoid blocking off their airway passage while in transit. This action causes minimal damage and the safety pin can be easily and quickly removed at any time if the patient starts to regain consciousness.

1.4 Cardio-pulmonary resuscitation considerations

It is not within the scope of this article to cover in any detail CPR techniques. However, the first aider and medical professional must be familiar with such procedures if they are to successfully deal with trauma cases.

Remember that there are essential differences in application when administering CPR to different groups (infant/child/pre-adolescent/adolescent/adult) and somatotypes (ectomorphic, endomorphic or mesomorphic). Some considerations of note are listed as follows:

– ventilation amount

– chest compression depth

– number of cardiac compressions and ventilations per minute

– patient handling techniques.

1.5 Cricothyroidotomy clarification

This procedure is performed as a life-saving operation to bypass an upper airway obstruction. Upper airway obstruction may be caused by oedema due to blunt trauma, smoke inhalation or even an anaphylactic reaction due to an insect sting (bee or wasp) or some other allergic reaction or blockage due to food or other articles ingested and trapped in the upper airway. If this is diagnosed and the airway cannot be cleared by normal conventional means such as positioning, rescue breathing or endotracheal intubation, then a cricothyroidotomy (also called a cricothyreotomy) must be performed immediately to save the patient's life. Note that this procedure is not carried out in children under 12 years of age. Children need different airway management.

A surgical airway is created by either a cricothyroidotomy (needle or surgical) or tracheostomy; the needle technique requires oxygen therapy to be available. Cricothyroidotomy must not be confused with tracheostomy (also called tracheotomy). A tracheostomy can be performed for either temporary or permanent use, whereas a cricothyroidotomy is only temporary. A tracheostomy is performed lower down the trachea, inferior to the cricothyroidotomy site. Tracheostomies are undertaken in operating theatres by experienced surgeons, since the thyroid gland and carotid arteries are in close proximity to the surgical site.

The word tracheostomy is also used in some medical articles to denote any procedure that results in an opening being made into the trachea, which would include, in this terminology, a cricothyroidotomy procedure. This can sometimes be confusing. When undertaking a cricothyroidotomy the tube inserted into the trachea to bypass the upper airway obstruction is often referred to as a 'tracheostomy tube' since it goes into the trachea; the same tube is used for both operative procedures.

Note that the cuff on a tracheostomy tube must not be overinflated as this may cause ulceration of the trachea and eventually scarring and contracture. It should be inflated until it just seals.