ANAESTHETIC MANAGEMENT FOR ATLANTO AXIAL SUBLUXATION

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ABSTRACT

A number of disease processes including congenital anomalies, malunited odontoid fractures, rheumatoid arthritis and tuberculosis can result in atlanto axial subluxation. The patient population presenting for surgery is therefore varied in age and general condition, ranging from fit young men to steroid dependent frail arthritic patients. The degree of instability and the spinal cord compression are also variable. Gauging these parameters has an important bearing on the anaesthetic management. We present management of six patients with atlato axial subluxation in our institution (JPMA41: 12, 1991).

INTRODUCTION

In 1842 Sir Charles Bell described the sudden death of a young man, due to the subluxation of upper cervical spine who had been admitted to the Middlesex Hospital in London[1]. Since then atlanto axial subluxation has been recognised as a rare but dangerous complication of a number of pathological conditions. Originally surgery was performed via the posterior approach, later an antero-lateral approach was advocated. More recently the transoral approach has been adopted as it provides better surgical access to the anterior cervical region.

MATERIAL AND METHODS

Brief history and surgical operations of the patients are shown in Table I.

Tabe I. History, clinical features, diagnoses and management of atlanto axial subluxation.

Sr. No.	Age & Sex	Pathological condition	History and symptoms	X-ray	Treatment
1.	51 years Male	Rheumatoid Arthritis	Weakness in limbs-10 mon. Staggering gait - 2 weeks. Bilateral increase in muscle tone. Babinski up.	- Altantoaxial subluxation - Myelogram-complete obstruction behind C_2 (Figure 1)	Posterior cranio cervical fusion with bone grafting from iliac crest. Crutchfield tongs.
2.	50 years Female	Rheumatoid Arthritis	Headache & numbness in both arms & legs generalized weakness 7-10 days. Weakness and flaccidity upper limbs.	-In extension-normal neural canal (Figure 2)-At lantoaxial subluxation at C_1 and C_2 after flexing the neck (Figure 3).	Posterior cranio cervical fusion with bone grafting from iliac crest. Crutchfield tongs
3.	35 years Male	Tuberculosis	Severe pain in the neck and occiput - 2-3 days. No neurological deficit.	X-ray: Erosion of body of C2 & anterior displacement of arch of atlas. C. T.: Body of C2 deformed probably infective or neoplastic.	Transoral removal of tuberculosis granulation tissue from C2. Cavity packed with bone chips. Anti-tubercular treatment. Halo vest.
4.	22 years Male	Trauma	Pain in the neck - 2 mon. No neurological signs.	Malunited fracture of odontoid. Anterior subluxzation C2. (Figure 4).	Transoral resection of odontoid and posterior occipito cervical fusion. Skull traction.
5.	40 years Male	Rheumatoid Arthritis	History of rheumatoid arthritis. Increased spasticity of limbs - 1 mon. O/E Quadriparous.	X-ray: Atlantoaxial subluxation.	Transoral excision of odontoid process and posterior occipito cervical fusion.
6.	28 years Male	Trauma	Paraesthesia in the neck and chest. Past history of trauma - 14 years ago.	Old fracture of odontoid process.	Transoral resection and post occipito cervical fusion.

Premedication

All patients received oral diazepam 0.15ml/kg two hours before surgery.

Induction of anaesthesia and airway management One of the most serious problems in these patients is that of upper airway management. We decided against elective tracheostomies and opted for endotracheal intubations. The decision on the method of induction and intubation was done preoperatively depending on the following criteria:

1. Extent of jaw movement and ability to open mouth.
2. The presence of neck braces, cervical collar or cervical traction.
3. Radiological findings at the cranio cervical junction.
4. Discussion with neurosurgeon regarding the extent of allowable neck movements.

All the patients' cervical spine had been stabilized preoperatively with either a cervical collar or crutch field tongs. In 5 patients minimal difficulty was anticipated because at preoperative assessment there was no restriction of jaw movement, the cervical spine was stabilized with either cervical collar or crutchfield tongs and after discussion with the neurosurgeon it was agreed that a slight degree of extension at the atlanto axial joint would be permissible.

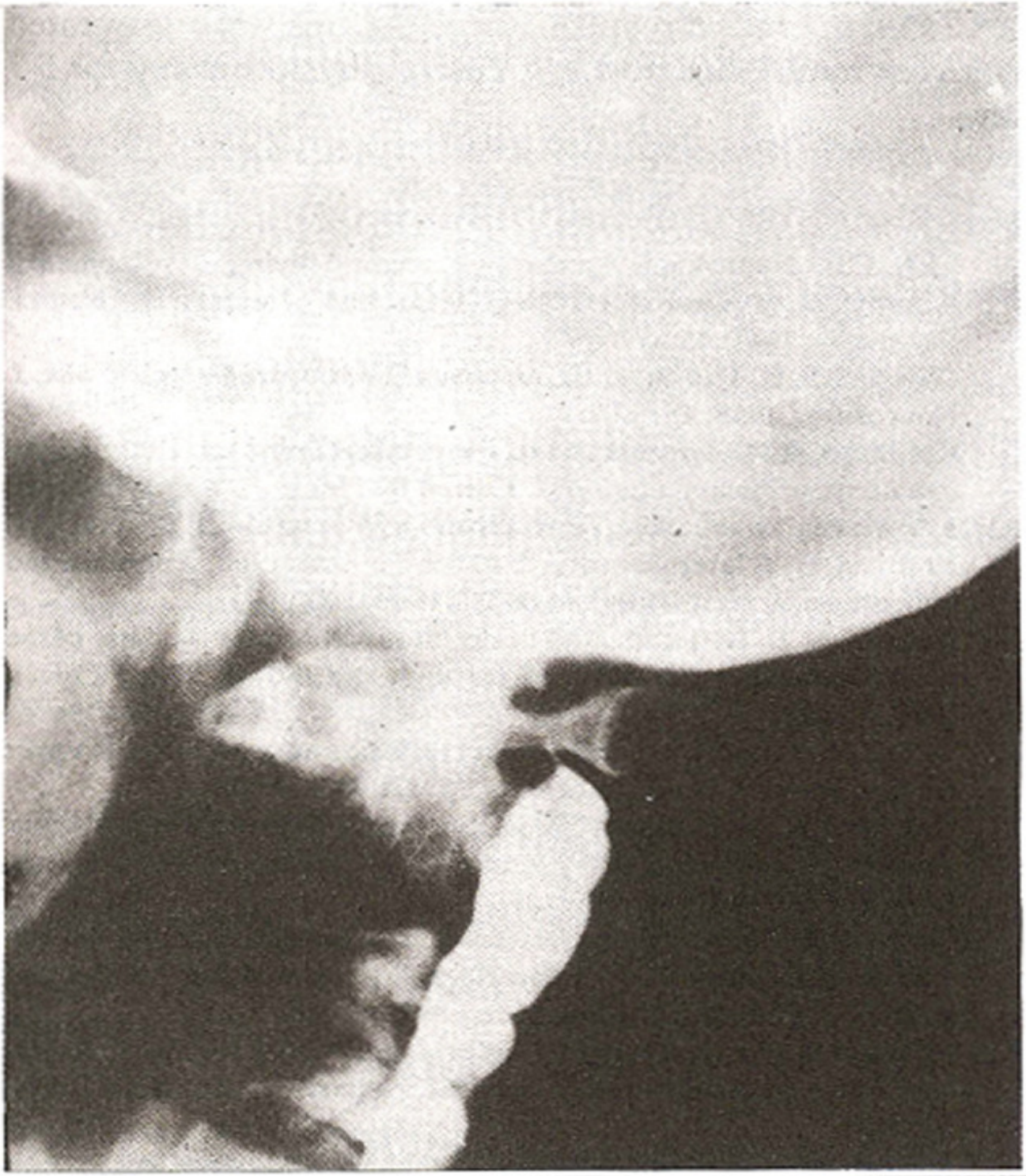

Figure 1. Cervical myelogram in atlanto axial subluxation. There is complete obstruction to the flow of contrast beyond a severely narrowed neural canal, opposite the anteriorly dislocated atlas over axis.

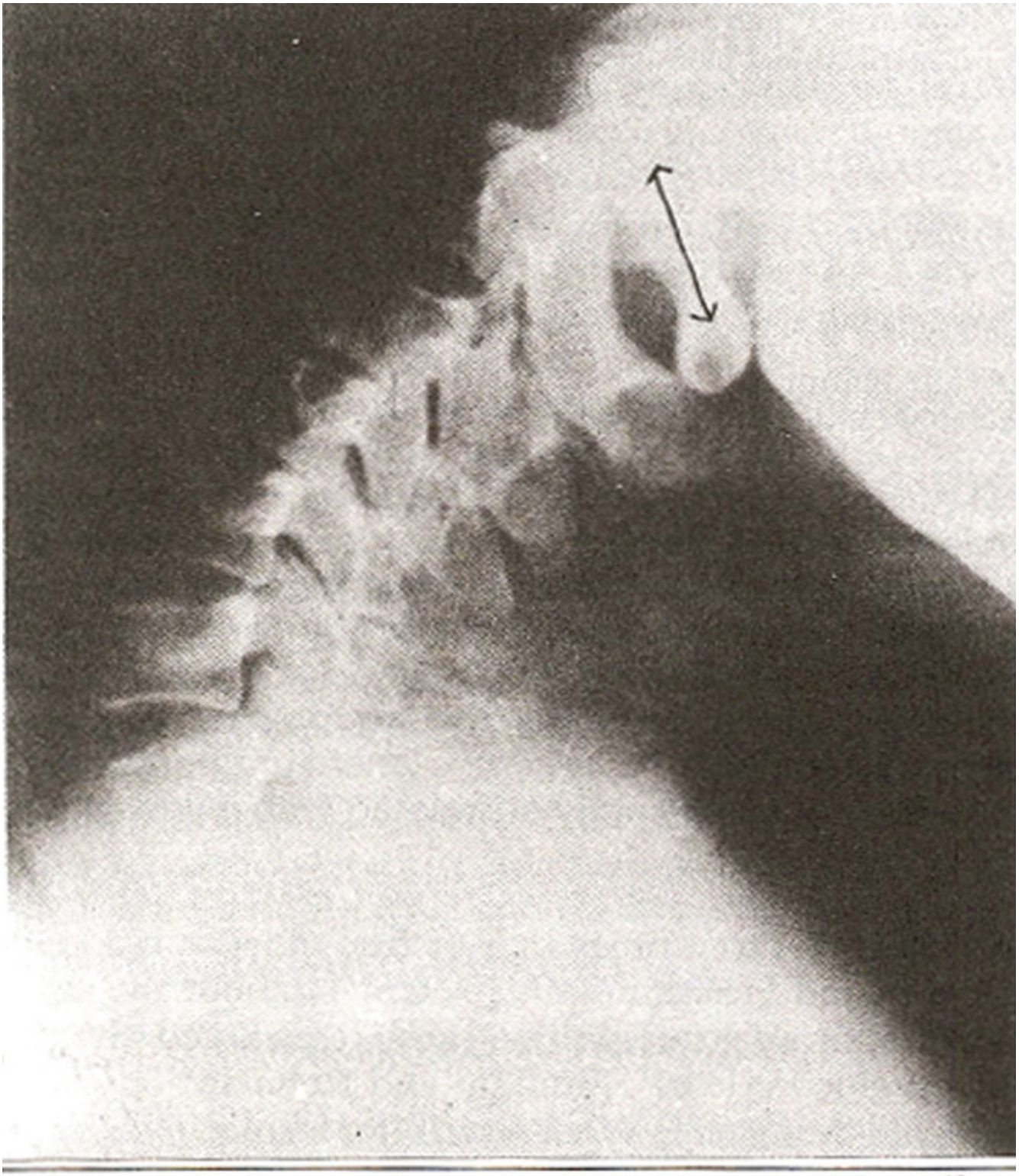

Figure 2. X-ray cervical spine showing normal neural canal. (See original text for further description).

Figure 3. X-ray cervical spine of the same patient after flexing the neck, revealing a severe atlanto axial subluxation at C_1 C_2, with odontoid displaced backwards.

These patients were preoxygenated with 100% oxygen for 3 minutes, and anaesthetized with a sleep dose of thiopentone and after making sure that positive pressure ventilation was possible on mask, 100mg of suxamethonium was given as the muscle relaxant of choice for intubation. Throughout induction and intubation the neck was held in the neutral position with complete avoidance of flexion

and allowing only minimal extension. Oxygen saturation was monitored throughout the procedure. Patients' trachea were intubated with latex reinforced oral tubes.

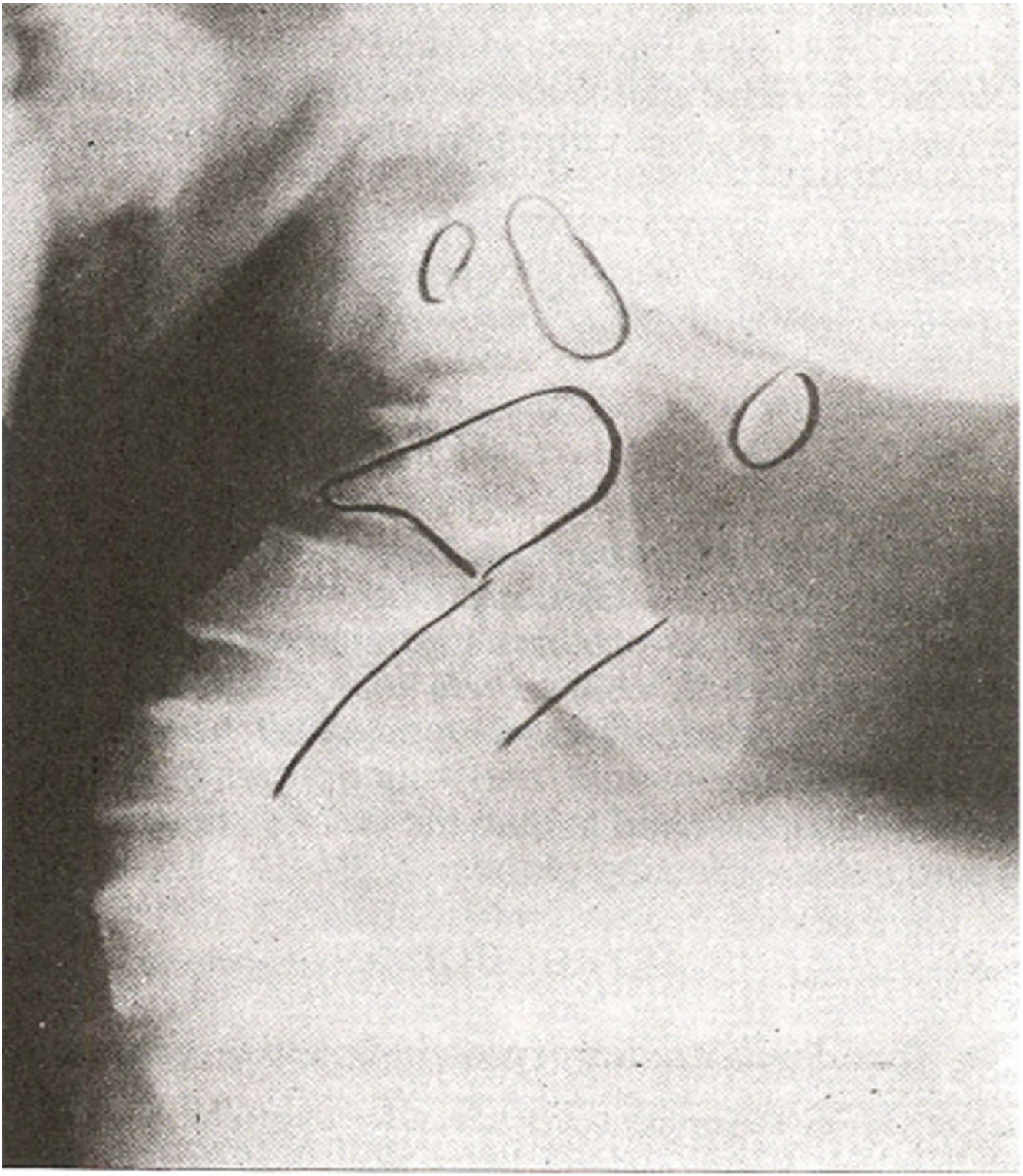

Figure 4. Fracture of the odontoid process with posterior dislocation of the lower fragment, causing cord compression.

In case 2 who came with a cervical traction on crutchfield tongs because of the critical nature of the cervical spine, it was decided to intubate the patient awake. The patient was given a mouth wash of 2

ml of 2% lignocaine, the pyriform fossae were anaesthetized by 1 ml of 4% solution using curved forceps and pledgets soaked in the local anaesthetic, vocal cords and pharynx were anaesthetized with 2 ml of 4% solution using a forester spray and the infraglottic portion with 1 ml of 4% lignocaine solution via a transtracheal injection. In case of failed intubation, a home-made device was kept at hand for transtrachealjet ventilation. This was made with a catheter mount and its tubing on 2 ml syringe and a 14G cannula attached to the syringe (Figure 5).

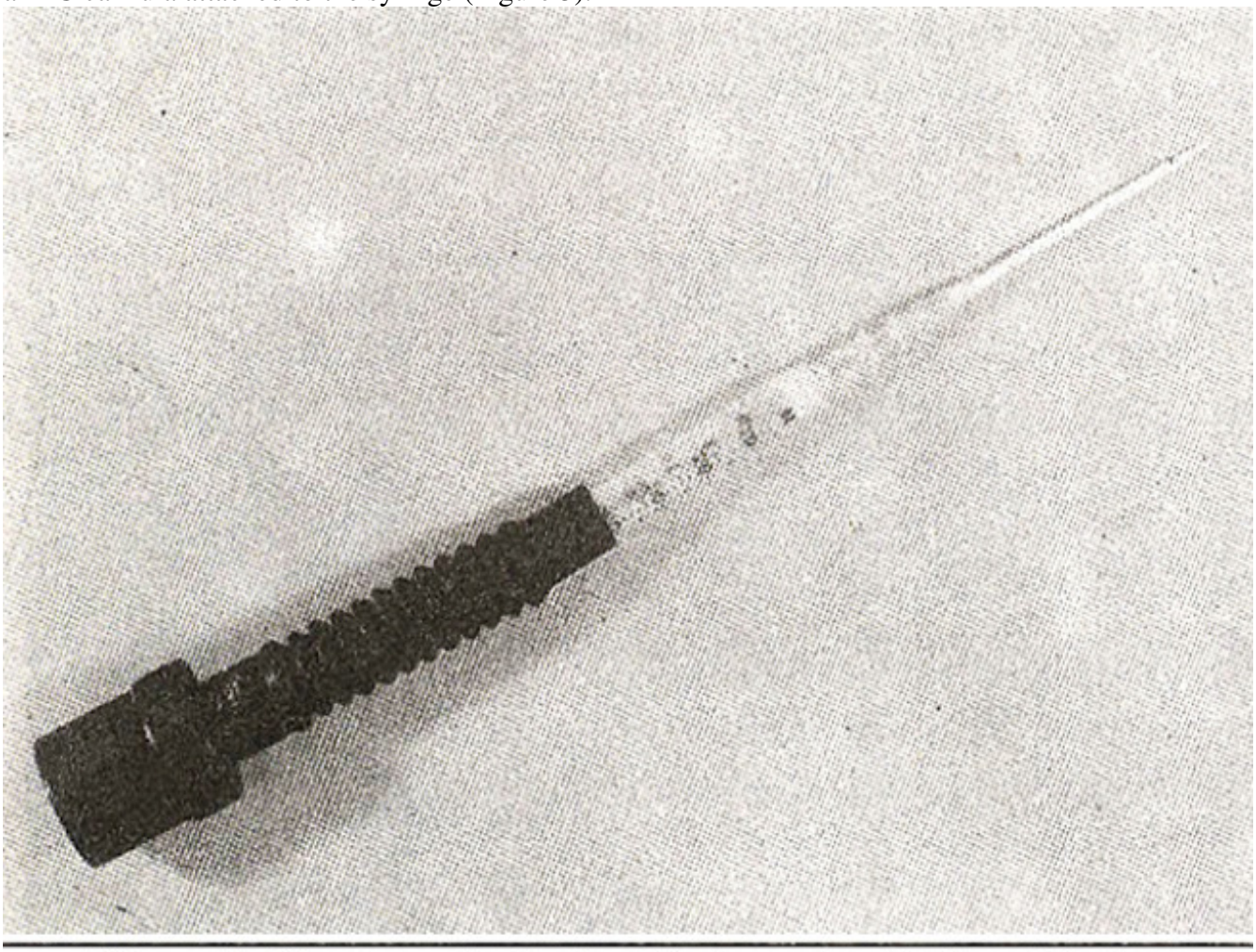

Figure 5. Home-made device for trans-tracheal ventilation.

Maintenance of anaesthesia

All the patients were paralysed with pancuronium 0.1 mg/kg and ventilated with 60% nitrous oxide and oxygen supplemented by 0.5% halothane. Intravenous pethidine was used as the analgesic component. In patients 4,5&6 where a combined anterior and posterior approach was used, after cervical decompression the oral endotracheal tube was removed and a cuffed portex nasotracheal tube was passed. The oral tube was preferred for the initial part of surgery because the surgeons were able to push it to one side while doing a central approach to the spine. Changes of endotracheal tube were carried out before turning the patient to the prone position because it was felt that it maybe more difficult to change the tube at the end of surgery because of swelling and oedema in the nasopbarynx. After reintubation the patients were carefully turned over to the prone position, great care was taken not to disturb the alignment of the neck by preventing any flexion or extension. Patients 1&2 were extubated postoperatively. Patients undergoing the oral approach were kept intubated for 24 hours postoperatively.

Monitoring during anaesthesia

Blood pressure was measured continuously via a radial cannula in the patients done by the oropharyngeal route. In the other patients it was monitored every five minutes using the Omega 1400 noninvasive blood pressure apparatus. ECG, end tidal carbondioxide (Datex) and oxygen saturation (Obmeda Biox 3700 Pulse Oximeter) were continuously monitored in all patients. Central venous pressure, urine output and core temperature were also recorded.

Postoperative management

During the immediate recovery period our aims were eto keep the airway patent, to prevent aspiration and to keep the neck stabk by avoiding any flexion or extension. Stability of the neck was achieved by placing all patients on skull traction with 5-8 lbs weight. Patients (I and 2) who underwent posterior cervical fusion only, were extubated immediately after completion of surgery and allowed to breathe spontaneously. Because of the danger of aspiration in heavilysedated patients nursed in the supine position with the neck held stable with skull traction, metaclopromide 10mg six hourly was given for 1-2 days and the nasogastric tube aspirated regularly for 1-5 days postoperatively. Cimetidine 400 mg six hourly was also given via the nasogastric tube. Patients 3, 4, 5 and 6 had extensive oropharyngeal surgery resulting in tissue trauma and pharyngeal oedema which could compromise the airway, it was therefore decided to keep the nasotracheal tube in place for the first 24 hours. Nasotracheal tube was removed after 24 hours. Patients 5 and 6 had respiratory problems preoperatively and were therefore electively ventilated for the first 24 hours. No problem was encountered in weaning these patients off the ventilator. Particular attention was also paid to mouth care in order to prevent infection of the pharyngeal wound. Postoperative analgesia was provided with I/rn pethidine. To prevent postoperative respiratory infection all patients were given broad spectrum antibiotics for five days. A protocol for postoperative management after transoral surgery has been developed (Table II).

Table II. Postoperative management in patients undergoing oral surgery for atlanto axial subluxation.

Airway:	
– Normal respiratory function preoperatively and surgery less than four hours duration	– Spontaneous ventilation via a nasopharyngeal airway till the oropharyngeal oedema and swelling subsides.
– Abnormal respiratory function preoperatively.	– IPPV for twelve hours postoperatively via the nasal endotracheal tube. Extubate after 24 hours depending on arterial blood gases.
Nasogastric Tube:	– To prevent regurgitation aspirate 4-6 hourly for 1-5 days.
Mouth Care:	– To prevent infection for 7-10 days.
Drugs:	
- Analgesia	– Intravenous or intramuscular pethidine 1 mg/kg four hourly for 1-2 days.
- Antiemetics	– Metaclopromide 10 mgs six hourly for 1-2 days.
- Cimetidine	– 400 mgs six hourly for 5-7 days.
- Antibiotics	– for 5 days.
- Hydrocortisone	– For 3-5 days.
Chest Physiotherapy	– To prevent chest infections for 5-7 days.

DISCUSSION

Instability of the cranio-cervical junction can be caused by a number of pathological conditions (Table III).

Table III. Causes of atlanto axial aubluxation.

Congenital	:	a.	Osteogenesis imperfecta
		b.	Congenital malformation of the vertebra
Traumatic	:	a.	In a normal cervical spine
		b.	In an abnormal (diseased) cervical spine
Infection	:	a.	Tuberculosis
		b.	Syphilis
		c.	Retropharyngeal abscess
		d.	Suppurating lymph nodes
Inflammatory	:	-	Rheumatoid arthritis
Tumours	:	a.	Primary
		b.	Secondary
Iatrogenic	:	a.	Post-radiation
		b.	Post-surgical

Different surgical approaches have been used for surgeryin this region. List attempted relief of anterior compression using the posterior approach with the patient in the sitting position[1]. With improved technique the mortalityrelated to this approach has been reduced but the long term results have not proved satisfactory. Cloward demonstrated the anterior approach[2]. Later anterolateral approach was described using an incision along the anterior border of sternocleidomastoid[3,4]. The transoral approach was first described by Kanavel in 1919[5]. Fang & Ong[6] published the largest experience with this approach. The transoral route gives good surgical access and is particularly helpful in atlanto axial subluxation. Posterior fusion is also done as a one-stage procedure under the same anaesthetic[7]. The major difficulty encountered in patients with atlanto axial subluxation is that of airway management during endotracheal intubation and prevention of any further damage to the spinal cord. Endotrachealintubation carries with it a risk of further subluxation and sudden flexion of the neck can lead to severe spinal cord compression. It is therefore of paramount importance to stabilize the neck preoperatively with either neck braces or skull traction before induction of anaesthesia, during positioning of the patient and during the recovery period. In addition, some of the patients with rheumatoid arthritis may present additional problems. They may have temporomandibular joint restriction or cricoarytenoid arthritis For the airway management of these patients some clinicians resort to elective tracheostomies. They claim that postoperatively tracheostomy allows easier observation and toilet of the pharyngeal wound and is more comfortable for the patients. All our patients had cervical collars preoperatively, except cases 1 and 2 who had crutch field tongs. We opted for endotracheal intubation on all our patients rather than tracheostomies to avoid the complications related to tracheostornies. In patients undergoing combined approach the patients were reintubated with a nasal tube for the latter part of surgery. This was done because initially an oral tube gave abetter exposure for the intra-oral part of surgery, and the nasotracheal tube is better tolerated than the oral tube in an awake patient in the early postoperative period. An important intraoperative problem in these patients is the detection of spinal cord compression. Hypotension can occur as a result of this but has

been shown to be a rather non-specific indicator of spinal cord cornpression[9]. One of our patients, (case S) developed profourrd hypotension (70/50) for a few minutes during the fmal tightening of wires. The blood pressure returned to normal without treatment once the pressure on the wires was released. Monitoring of somatosensory evoked potentials has been recommended' as a reliable intraoperative method for evaluation of spinal cord dysfunction[10]. Marks[9] on the other hand pointed out that somatosensory evoked potential demonstrates damage to the posterior tracts only but anterior compression cannot be detected. Corticospinal tract monitoring may therefore be a better solution to the above problem . Wake up test is another form of monitoring spinal cord compression; [11] careful monitoring of respiratory rate, tidal volume and respiratory pattern in a spontaneously breathing patient may provide an early warning of medullary problems in these patients. Reverting the patient to spontaneous ventilation before interlaminar wires are tightened is a technique of exçertise and unless mastered in routine surgery can be dangerous if the patient starts bucking or coughing when the relaxant is allowed to wear off. Bleeding is not a major problem during this procedure and was not a problem in any of our patients. Stability of the cervical spine and management of the airway are the two major problems in the immediate postoperative period. Patients were nursed supine and their cervical spine stabilized by the application of crutchfield tongs and cervical traction with a weight of 7-10 lbs. In patients undergoing extensive oral surgery airway was assured by keeping the nasotracheal tube in place for the first 12-24 hours. Patients who had respiratory problems in the preoperative assessment were electively ventilated in the immediate postoperative period thereby allowing adequate suctioning. Postoperative respiratory infections were prevented by giving antibiotics and aggressive physiotherapy for 5-7 days.

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