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CRANIOMAXILLOFACIAL SURGERY : ANAESTHETIC MANAGEMENT

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SUMMARY

Craniomaxillofacial surgery poses a major challenge to clinicians. A multidisciplinary approach is required with the anaesthesiologist playing a vital role in the outcome. The anaesthetic management of three cases is presented alongwith a discussion on the problems likely to be encountered. Craniomaxillofacial surgery can be performed in any hospital equipped for Neurological, Paediatric surgery, and Plastic Surgical work.

The era of Craniomaxillofacial surgery dawned with the pioneering efforts of Paul Tessier in the late 1960's and has achieved a status where it may be called a speciality in itself (Jackson et al., 1982).

Procedures initially refined for correcting congenital deformities such as Hypertelorism, Craniostenosis and Apert's syndrome have found multiple spin offs in the treatment of major traumatic skull fractures, cosmetic surgery and malignancy (Converse et al., 1975; Munro, 1985; Whitaker, 1979).

A team approach is required with representation from various disciplines including Anaesthesiology, Neurosurgery and Plastic surgery, Ophthalmology and Psychiatry among others (Jackson et al., 1982), in order to correctly assess the problems involved and pave the way for a successful outcome. Specialised centres do exist but such surgery can be performed in any well-equipped hospital with Paediatric, Neurosurgical and Plastic facilities (Montandon et al., 1986).

Case Reports

1. The first patient ET, 4 year female, was having Craniostenosis. She had maxillary retrusion. Combined Cranio-facial approach was used. Through a coronal incision, the frontal bone was lifted out. The orbital roof was also dissected out after severing all other bony attachments. Both the frontal bones and the supra orbital ridge were advanced and fixed in that position by stainless steel wires. Both the canthi ligaments were also given new attachment, Maxillary advancement was done by Lefort III osteostomy. The resultant bone gaps were filled with split rib grafts from the 6th rib. Throughout the procedure the ventilation

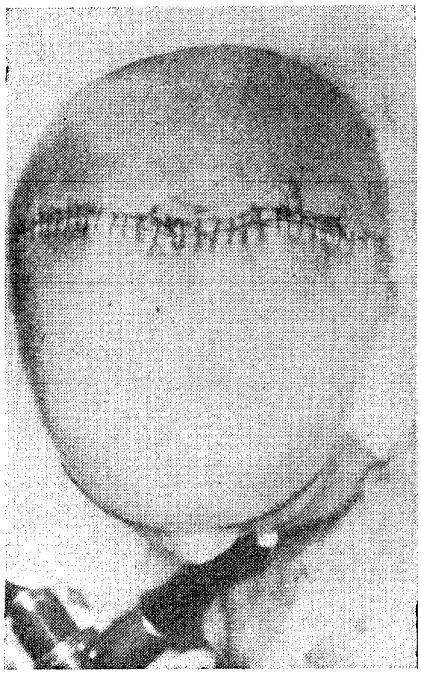

Fig. 1. Craniostenosis : On completion of operation the sutured coronal incision and non-rebreathing valve is seen.

was controlled and carried out manually via a Magill circuit with non-rebreathing valve. Blood loss during surgery was promptly replaced. Brain bulk was kept under check with mannitol and hyperventilation with halothane. Monitoring aids consisted of a pulse monitor attached to the great toe, a precordial stethescope and urinary catheter. On termination of anaesthesia neuromuscular blockade was reversed and the patient extubated. The total operating time was 5 hours.

2. The second patient ST, female 24 years, had a bilateral congenital cleft lip and deformity of palate. Earlier she was operated for cleft lip and palate. Still certain secondary deformities persisted. She had bilateral collapse of maxillary arches with anterior palatal fistula. She had a classical cleft lip nose deformity along with prominent scars of previous lip repair. The lip was opened up again. Anterior palatal fistula was closed. The nasal deformity was corrected by mobilizing the nasal cartilages and using an aural cartilage graft. Then bilateral maxillary Lefort I osteotomy was done to correct the occlusion. An occlusion splint was given. Finally the mid face was built up by onlay bone grafts. Manual ventilation was carried out via a Magill circuit with non-rebreathing valve. Monitoring aids consisted of a blood pressure cuff over the thigh and a pulse monitor attached to the great toe. At the end of operation neuromuscular blockade was reversed; however a nasotracheal tube was left in situ for 12 hours as it was felt that the airway may be compromised in the post-operative period. Duration of surgery was $3\frac{1}{2}$ hours.

3. The third patient SP, male 5 years, was operated upon for a frontoethmoidal meningocele through a coronal incision. The coronal flap was raised. Frontal bone and the root of nose were exposed. Free flap bifrontal craniotomy was done, dura was separated from the frontal bone and meningocele visualised. The frontonasal meningocele was separated from the frontal bone. Extradural ligation of meningocele was done with the help of neurosurgeon. The extra cranial portion was excised. The medial canthal ligaments were given fresh attachments to correct psuedo-hypertelorism. A small calvarial graft was taken from the parietal bone and bone gap at the meningocele site was obliterated. The circuit used was an Ayre's T-piece with manual ventilation. The pulse monitor was not available. The monitoring used was a precordial stethescope and indwelling urinary catheter. Duration of surgery was 5 hours.

Induction in all cases was with thiopentone and suxamethonium; maintenance with oxygen, nitrous oxide and halothane. Pancuronium bromide was used to provide neuromuscular blockade.

Due to continued bleeding in the immediate post-operative period, the first patient became cyanosed and was managed with oxygen and transfusion. Apart from fever and gross swelling of the face and neck in all cases, which resolved spontaneously over a few days, there were no significant complications.

Discussion

Anaesthetic management is a challenge from the point of view of airway management and post-operative care, Clarke (1975) and Davies et al., (1975). Pre-operative examination needs to be comprehensive to exclude associated abnormalities of the CVS such as Fallots's tetralogy (McMichan). Investigations include pulmonary function, blood profile, coagulogrammes, electrolytes, blood gas analysis and acid-base status (McMichan).

Multiple angle radiographs and CT scans are essential for a good understanding of the airway abnormalities and assessing the intubation problems (Ferguson et al., 1983).

Though we did not encounter any difficulty in intubation, severe deformities with mandibular hypoplasia may render intubation impossible (Lauritzen et al., 1986). Before resorting to tracheostomy, various methods may be tried out including intubation with a railroad

technique and the use of fiberoptic devices (McClelland; 1972 and Ramsey et al., 1981). Tracheostomy still has to be done when a Le-fort III osteotomy with simultaneous advancement of the maxilla and forehead is planned (Smith, 1980). We used uncuffed armoured tubes in the children and a cuffed tube in the adult patient.

Anatomically formed RAE tubes (Ring et al., 1975) and PVC tubes with a floppy cuff (Geffin et al., 1969) are claimed to prevent tracheal stenosis after prolonged intubation.

Operative manipulations may result in the tube being dislodged or damaged. A very ingenious method has been suggested to prevent displacement. This involves making a surgical incision in the submental region and pulling the tube out through this, after intubation in the normal manner (Altemir, 1986). On termination of anaesthesia the tube is removed and the incision sutured.

With the head end occupied by the operating team, the anaesthesiologist is placed at a disadvantage in terms of accessibility to the patient. Monitoring tends to be remote and the anaesthetic circuit should be long and flexible enabling the anaesthetic machine to be positioned at a safe distance.

Though we used a Magill circuit and Ayre's T-piece, a Bain circuit would have been ideal. This has many advantages including dual function for spontaneous/controlled ventilation, ease of attachment to a ventilator, scavenging, flexibility, heating of the inspired gases and low fresh gas flow requirements (Bain et al., 1972).

The duration of surgery tends to be rather long and bone grafts may be harvested from the ribs. Omental grafts may also be required. The patient should be in a comfortable position with due attention to pressure points. The head up position required by the surgeon leads to a fall in blood pressure and the lower limbs should be appropriately placed. Operating time can be reduced by the simultaneous working of two or three operating teams.

Inspired gases should be humidified and heated. Hypothermia is a very real danger with various contributory factors—young age of patients, long surgery in air conditioned theatre, cold inspired gases and drapes soaked with blood and flushing solutions. Active warming with water flow mattresses has been advocated (Davies et al., 1975) for patients being operated upon in temperate climate.

Blood loss during surgery was extensive and we replaced this with whole blood. Ideally fresh blood should be used as banked blood has a poor oxygen carrying capacity and alters the coagulation profile. Sufficient blood, over and above the anticipated losses should be kept in reserve along with coagulation factors and platelets. Losses tend to be underestimated. Ringer lactate and 5% dextrose (4 ml/kg/hr) are useful supplements to maintain a urinary output of 1 ml/kg/hr. We used intravenous calcium supplementation following use of stored blood as this prevents hypotension and improves the circulation even though the need for such use is not universally accepted.

The monitoring aids used by us apart from clinical judgement were a precordial stethescope, pulse monitor, sphygmomanometer and urinary catheter. We did not use CVP or ECG monitoring. More comprehensive monitoring techniques would certainly be safer and even mandatory with techniques like induced hypotension.

Cardiovascular monitoring would include ECG, Blood pressure (Invasive, Doppler or Oscillotonometry), CVP and Transcutaneous oxymetry. Respiratory monitoring includes inspired and expired O_2, CO_2 and anaesthetic agents, blood gases and pH, airway pressures and ventilator function and specific monitoring for air embolism. Cerebral function monitoring gives an early warning of brain ischaemia. Neuromuscular blockade, urinary output, temperature, electrolytes, blood losses and coagulation time are other variables which should be kept under constant surveillance.

Reflexes mediated through the ciliary gang-

lion during orbital displacement can lead to severe brady rhythmias or arrest. A fully vagolytic dose of atropine is curative.

We obtained a reduction of brain size with mannitol and hyperventilation with halothane. The other methods advocated are loop diuretics, steroids and direct removal of CSF. The dangers of hypocapnia include cerebral vasoconstriction with consequent ischaemia (Wollman et al., 1964).

Induced hypotension may certainly lead to a reduction of blood loss but many a time hypotensive anaesthesia is not needed or may even prove hazardous (Ward et al., 1980). Removal of the cerebral vault and manipulation of the brain may lead to ischaemia. Circulation can be manipulated with labetolol and halothane. Full-fledged induced hypotension with systolic pressures two thirds of normal can be carried out with sodium nitro-prusside or trimethaphan or combination (Mac Rae et al., 1981).

At the end of operation the oral tube is removed but a nasal tube is best left in situ as subsequent edema may lead to respiratory obstruction. The tube should only be removed when it is felt that the airway would remain patent without it or when it gets blocked. Full facilities for reintubation, interdental and intermaxillary wire fixation, wire cutters should always be available at the bedside. Monitoring needs to be continued into the post-operative period as continued bleeding from the operative site leads not only to hypotension but also mechanical airway obstruction.

Cerebral compression may lead to a loss of consciousness and blindness (Teasdale, 1976). This is an indication for urgent decompression. Bone grafts are used extensively including rib harvests. However the skull now serves as the main donor site.

All our patients developed severe edema of the face and neck, which resolved spontaneously over a few days. Steroids may be put to good use here. Pyrexia was another feature which settled on its own.

Critical nursing care includes enrichment of the inspired gases with oxygen, humidification, care of the intravenous lines and catheters, fluid and electrolyte balance, nutrition, care of eyes, bowels, wound and pressure points.

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