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*This series aims to enhance the healthcare team's awareness of the importance of early detection by recognizing signs and symptoms of orofacial cancers and their management, and of prevention. It discusses treatment complications from surgery, radiotherapy (RT) and chemotherapy (CTX), summarizing the outcomes of a meeting on 'Oral Healthcare in People Living with Cancer' held in 2010, attended by 300 delegates from 33 countries – dentists, specialists, and Dental Care Professionals (DCPs), and the cancer support team. There is a considerable body of literature on oral cancer but very little is written on healthcare aspects of people living with cancer and a particular focus of this meeting was caring for survivors. The Faculty included European leaders in the field who have authored the series. The full peer-reviewed papers from the meeting are published in *Oral Oncology* 2010; **46**: 485–570.*

Oral Cancer: Comprehending the Condition, Causes, Controversies, Control and Consequences

11. Surgical Complications and Adverse Effects

Most patients with oral cancer undergo some form of surgical intervention, ranging from the diagnostic to the therapeutic, and from major to minor. Because of the anatomic location of the vital organs of speech, swallowing, and respiration, complications can arise from surgery which may be severe, debilitating or even fatal. Bilateral neck dissection in particular can result in increased morbidity and mortality with higher rates of infection, fistulae and complications such as facial oedema, particularly if both internal jugular veins are simultaneously sacrificed.

It is crucial that all such potential complications are discussed with the patient prior to surgery, and balanced against other options for treatment. The dental team should also be aware of the various possibilities.

Post-operative complications

Pain

For at least the 24 h or so after

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surgery post-operative pain is usually present; at first constant, but eventually present only on local pressure. For the first 48 hours pain should be controlled with regular analgesia (see Article13). Severe pain may need to be controlled by opioids.

Oedema

The amount of post-operative oedema depends largely on the extent of surgery but varies between individual patients. It can be reduced by:

- Minimizing the duration and extent of the operation;
- Using corticosteroids (eg 4–8 mg dexamethasone IV);
- Nursing patient in head-up position.

In all cases where significant post-operative swelling may compromise the airway, a prophylactic tracheostomy should be considered.

Trismus

Trismus can be reduced by minimizing the above factors and minimizing the stripping of muscle off bone.

Eating problems

Apart from pain, nausea and dysphagia, many patients need a special soft or liquidized diet. Dieticians should be consulted.

Patients with difficulty eating should be weighed regularly. Nutrition may need to be supplemented:

- Enterally by naso-gastric (NG), oro-

gastric tube, percutaneous endoscopic gastostomy (PEG) or radiologically-inserted gastrostomy (RIG). Continuous infusion of a liquid feed is preferred, as intermittent feeding may cause diarrhoea;

- Parenterally, ie via an IV catheter in the subclavian or jugular veins (total parenteral nutrition; TPN). Though this is best avoided, if it is necessary regular monitoring of urea, electrolytes and liver function is mandatory.

Wound infection

Wound infection is common after oral cancer surgery and can produce significant morbidity, poor functional and cosmetic results and prolong hospitalization. Factors contributing are:

- Male sex;
- Advanced tumour stage;
- Extensive surgery (complex reconstruction, tracheostomy and feeding tube also contribute since they are surrogates for this);
- Co-morbidities.

The diagnosis of infection is usually obvious as, at about 3–7 days after operation, the wound appears inflamed, swollen and tender. There may be an associated discharge of pus and pyrexia. Infection under neck flaps is particularly dangerous as the internal carotid artery may be eroded (see below).

There may be no need to give antibiotics, as infections may settle spontaneously within a few days.

However, pus or a swab should be taken to identify the organism and test sensitivity to antibiotics.

If the wound is not draining but is fluctuant, one or more sutures should be removed from the most inflamed area, sinus forceps inserted and gently opened to allow drainage of pus.

Flap complications

Micro-surgical flap transfers are usually long, technically demanding and therefore physiologically traumatic operations for the patient. Potential major complications include myocardial infarction, stroke and death. Contra-indications for flap procedures therefore include co-morbidities that impede toleration of prolonged general anaesthesia. Advanced age is not necessarily a contra-indication however, nor is a potentially severe medical co-morbidity that is well controlled. Post-operative staff must be familiar with the general care of the micro-surgery patient. A hyperdynamic circulation with adequate hydration, filling pressures, urine output and body temperature should be the aim. Pain should be controlled to prevent anxiety that in turn leads to vasoconstriction. Anticoagulation may be helpful (eg Dextran 40, heparin, or aspirin).

Free tissue transfer success is good, but flap loss can be devastating and often is a prelude to further major interventions. Flap vitality is monitored by careful, regular and frequent clinical examination for the first 48 hours (flap colour, skin turgor, refill etc). Some surgeons prefer to include a needle test which should result in the oozing of bright red blood up to a minute after the needle is withdrawn. Others use monitoring techniques such as Doppler ultrasound, temperature monitoring, pulse oximetry and near infrared spectroscopy. If flap vascular compromise is suspected, the general condition should be immediately assessed (eg exclusion of hypotension), the patient repositioned to try and relieve any pedicle compromise, haematoma excluded and compressive

dressings or tight sutures removed. If such simple manoeuvres fail, and the patient's general condition permits, the flap must be re-explored immediately.

Other, rarer complications

Vascular complications

Major blood vessel involvement should be assessed pre-operatively with appropriate imaging. Selective sacrifice of the common or internal carotid arteries can produce some of the most serious complications in head and neck surgery but the morbidity is lower than in those patients in whom emergency ligation has been necessary during a hypotensive episode, such as due to haemorrhage. Balloon-test occlusion with hypotensive challenge reliably assesses the pre-operative risk when internal carotid artery resection is planned.

In bilateral neck dissections where one internal jugular vein (IJV) is preserved, post-operative imaging shows thrombosis in up to 30%. If both IJVs are to be transected then conduits in the external venous system should be preserved wherever possible. Bilateral internal jugular vein (IJV) ligation may produce raised intracranial pressure (ICP) along with secondary hypertension (Cushing reflex). The rise in ICP commonly requires aggressive treatment – hyperventilation, fluid restriction, corticosteroids and mannitol. There can be a significant rise in ICP in a staged second neck dissection, even if the subsequent operation is years after the initial one. Carotid blow-out is more likely where the patient has had radiotherapy, if damage to the adventitial layer of the artery occurs during surgery and if a salivary fistulae occurs. It is associated with over 60% morbidity and 50% mortality. If it is anticipated that the carotid artery will be exposed, the vessels should be covered, eg dermal graft, fascia lata or levator scapulae muscle flap. If impending blow-

out is suspected (eg from a sentinel bleed), endovascular techniques with stent-grafts may be preferred over emergency open carotid artery ligation (which may well be complicated by neurological sequelae such as hemiplegia, hemi-anaesthesia, aphasia and dysarthria).

Air embolism is rare but potentially lethal. Most commonly following damage to the IJV during surgery, large air emboli produce sudden falls in end-tidal carbon dioxide and blood pressure and, in severe cases, air can be aspirated from the right side of the heart. A precordial Doppler probe may detect a characteristic murmur. Pressure should be applied to the affected vein and the patient placed in the Trendelenburg position and rotated to the left. Hyperbaric oxygen is the ultimate and effective treatment.

Seroma

Seroma is the accumulation of serous fluid under large flaps, particularly in the neck. It appears as a large fluctuant swelling that is neither warm nor tender. Seromas may have to be drained several times using large syringes and needles or cannulae. Moderate pressure dressings should be applied.

Sialocele

Sialocele is a swelling due to leakage of saliva occasionally appearing over the area of the parotid following partial parotidectomy. Sialoceles usually settle spontaneously with time, but may need to be managed in a manner similar to seromas. A hyoscine transdermal patch may be helpful.

Frey's syndrome

Frey's syndrome is characterized by redness and sweating of the skin, warmth or sweating, eating or thinking or talking about food. Test with lemon or a positive starch-iodine test can be diagnostic. Frey's syndrome may follow damage in the parotid region by trauma, submandibular

gland surgery, neck dissection, or carotid endarterectomy. Treatments include topical hyoscine or intradermal injection of Botox.

Chyle leak

Chyle leak arises from damage to the chyle duct. The key is prevention. Intra-operative identification can be facilitated by placing the patient in the Trendelenburg position, or adopting a forced Valsalva manoeuvre. Chyle leaks are often only identified when feeding is begun. Multiple approaches include nutritional, surgical and pharmacological therapy, but no definitive evidence supports one particular therapy.

Nerve damage

The spinal accessory nerve to the trapezius muscle can and should be safely preserved without jeopardizing tumour removal, as long as it is not grossly invaded by cancer. Cervical branches of the spinal accessory nerve should always be preserved to enable useful muscle function. If there is significant shoulder disability post-operatively then progressive resistance exercise training is indicated.

Other nerves also at risk include the vagus, lingual, hypoglossal and marginal mandibular branch of the facial nerves. Intentional transection of the vagus nerve can result in intra-operative cardiac problems of which the anaesthetist needs to be forewarned. Transient neuropraxia to the phrenic branch of the vagus is often manifested post-operatively with changes on plain radiography but, if a severe pulmonary problem exists, especially with concurrent pectoris major flat harvest, respiration may be compromised. Bilateral phrenic nerve palsies may necessitate periods of prolonged mechanical ventilation. The sympathetic trunk is also at risk of injury, but subsequent Bernard-Horner syndrome in the post-operative period affects less than 1%. Paralysis of the cranial nerves occurs only rarely (less than 2% of neck dissections) and as such they are difficult to predict but are not associated with non-neurological complications.

The brachial plexus is not usually encountered other than in the extended neck dissection.

Pneumothorax

Pneumothorax may occur when surgery is low in the neck, particularly if the lung apex is high. Pleural tears should be closed and their integrity tested by hyper-inflating the lung, placing the patient in the Trendelenburg position and irrigating the area to observe bubbles. Imaging can determine the need for open drainage.

Despite the very best planning, complications can still occur but their impact can be minimized by peri-operative vigilance.