

ANAESTHESIA AND THE ATHLETE

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The term ‘anaesthesia’ is derived from the Greek ‘an-’ (meaning ‘without’) and ‘aisthesis-’ (meaning ‘sensation’). In medical terms it denotes the triad of a reversible loss of consciousness, the ability to feel pain and muscle relaxation. It is a relatively recent medical speciality, coming into existence a little over 150 years ago. Without anaesthesia, surgery would not be the speciality it is today.

For hundreds of years, operations were performed only as a ‘last resort’ because of the excruciating agony that the patients felt while the surgeons performed their bloody task. Many patients chose certain death rather than undergoing surgery.

But on 16 October 1846, at Massachusetts General Hospital in Boston, USA, modern medicine changed forever. William Morton administered the first general anaesthetic to a patient for the removal of mandibular lump – the speciality of ‘anaesthetics’ was born. Since then, there has been an explosion of this speciality which now encompasses

perioperative medicine, acute and chronic pain, critical care medicine, hyperbaric and dive medicine and aeromedical transportation as well as the provision of ‘anaesthesia’ in operating theatres. Anaesthesia has become sub-specialised to such a degree that there are now anaesthetists for such diverse surgical specialities including: cardiac, neurosurgery, obstetrics, paediatrics, maxillofacial, burns, trauma, neonatal, day case and now – a very new field – ‘sports anaesthesia’.

This new focussed area of anaesthesia involves the care of the elite athlete from the moment he or she arrives in the anaesthetic pre-admission clinic to their discharge from hospital after their operation – and occasionally – beyond. It encompasses not only an expert knowledge of general and regional anaesthesia and pain relief, but also pathophysiology unique to the elite athlete, psychological issues and concerns related to professional sport as well as a thorough knowledge of WADA (World Anti-Doping Agency) guidelines and substance abuse.

It also has the added pressure of being under scrutiny from a very wide circle of concerned individuals – not only are the patient, family and team members involved, but also team coaches, team doctors, club owners, media and fans. As the recent tragic example of Michael Schumacher’s accident highlights, everything that happens to an elite athlete while in hospital is examined in the most intense public eye and this can be very uncomfortable and stressful. This is an area for excellence and expertise, with no room for ultracrepidarianism or lackadaisicality.

Below are a few examples from this exciting and emerging field of anaesthesia.

PREOPERATIVE ASSESSMENT

Although most elite athletes are – by definition – fit and healthy, common medical issues do arise in the pre-admission clinic. Asthma, diabetes and other endocrine concerns need to be optimised and investigated prior to anaesthesia, as they



would be for any patient. This occasionally necessitates enhancing current medication regimes, requesting and acting on further investigations to ensure safe anaesthesia and occasionally a referral to other areas of expertise for investigation of any previously unknown pathology.

Physiological state

Specific concerns surrounding the athlete involve any possibility of cardiac issues, arrhythmias or 'athlete's heart'. These can be problematic to diagnose and assess, but if not done so can have catastrophic results. Close liaison with screening departments and cardiologists is vital, as is a thorough knowledge of cardiac investigations and care. The normal distribution of results does not necessarily apply to athletes, who are generally considered above the 95th percentile of the population in most physiological parameters – hence in many instances, a professional judgement needs to be made as to whether so-called 'abnormal' results, are in fact 'normal' for the athlete.

Athletes also attend from across the globe, so a thorough knowledge of regional illnesses (Sickle Cell disease and the

Thalassaemias for example) is vital for safe and optimal care.

It remains particularly vital to ask about drug and medication history – especially the use of any banned substances. Of course, doctor-patient confidentiality remains sacrosanct, but to be aware of the use of such substances as erythropoietin, frusemide, amphetamines and anabolic steroids is an

important safety issue prior to performing anaesthesia.

Anabolic steroids

The effects of long-term use of anabolic steroids in particular can be exacerbated under anaesthesia. For example:

- **Psychiatric issues:** Aggression, hypomania and psychosis can manifest after anaesthesia. In the most extreme analysis, depression and suicide can also occur.
- **Hypercoagulability and polycythaemia:** with subsequent myocardial infarction and cerebrovascular accident.
- **Cardiovascular concerns:** The effects of long-term steroid use include: ventricular hypertrophy, cardiac arrhythmias, diastolic dysfunction, myocardial infarction and sudden cardiac death. There can also be huge swings in blood pressure while under anaesthesia with subsequent risk of cerebrovascular accident or intracerebral haemorrhage.
- **Hepatic injury.** Long-term steroids can induce hepatic impairment which can become a chronic condition and deteriorate into an acute encephalopathy

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on interaction with certain anaesthetic agents

- **Endocrine concerns.** Steroids can cause insulin resistance, hyperglycaemia and sodium imbalance.
- Inhibitory effect on the immune function and **delayed healing.**

Thus all legal or illicit drug use needs to be fully elucidated and any untoward effects fully investigated and reversed prior to anaesthesia. Also, the use of 'accessory drugs' such as thyroxine, growth hormone, beta-blockers or insulin must be assessed and excluded. These can also have severe, life-threatening side-effects while under anaesthesia.

Psychological state

In addition to the physiological state of the athlete, the psychological status also needs to be addressed and considered. Many athletes are concerned about time away from competition, possible adverse effects of general and regional anaesthesia and long-term complications resulting from this. Although anaesthesia is now very safe (mortality directly related to anaesthesia is now less than 1 in 250,000), complications and adverse effects do still occur. The role of the clinical psychologist is vital in the pre-admission clinic, where psychological aspects of care and concern can be addressed and optimised.

On occasion, care of the coaches, team doctors and physiotherapists and other team members is also required, necessitating reassurance, information dissemination and ongoing discussion. It is important to realise that the whole sporting team is affected by one vital member being indisposed, with subsequent effects on all those in the team. Pressure can sometimes mount to try to limit time away from competition, but it remains paramount that the care of the athlete remains the primary concern. It is vital to ensure that the patient – and at times all those in the attending entourage – are aware that all aspects of anaesthesia are designed to expedite this return to play in the most precipitous, and ultimately safest, manner possible. To gain the trust of those concerned is a most important part of the preoperative consultation.

CHOICE OF ANAESTHESIA

In most instances, the choice of anaesthesia remains a straightforward choice between general vs regional anaesthesia.

General anaesthesia involves the administration of an intravenous anaesthetic agent and the maintenance of the body within physiologically normal parameters while the insult of surgery occurs. The choice of general anaesthetic agent is important as different agents have different effects – the choice is generally between total intravenous anaesthesia (TIVA), using a variety of anaesthetic agents and inhalational anaesthesia (also a variety of different drugs) – or a combination of both methods. The type of agent used is determined according to patient history and type of surgery. In almost all cases, intravenous opioids are also needed to allow for adequate analgesia postoperatively.

Regional anaesthesia involves the reversible blockade of nerves to the affected area. This can be performed via neuraxial blockade (epidural or spinal block) or via a regional block of nerves with local anaesthetic agents – commonly under ultrasound guidance. These blocks

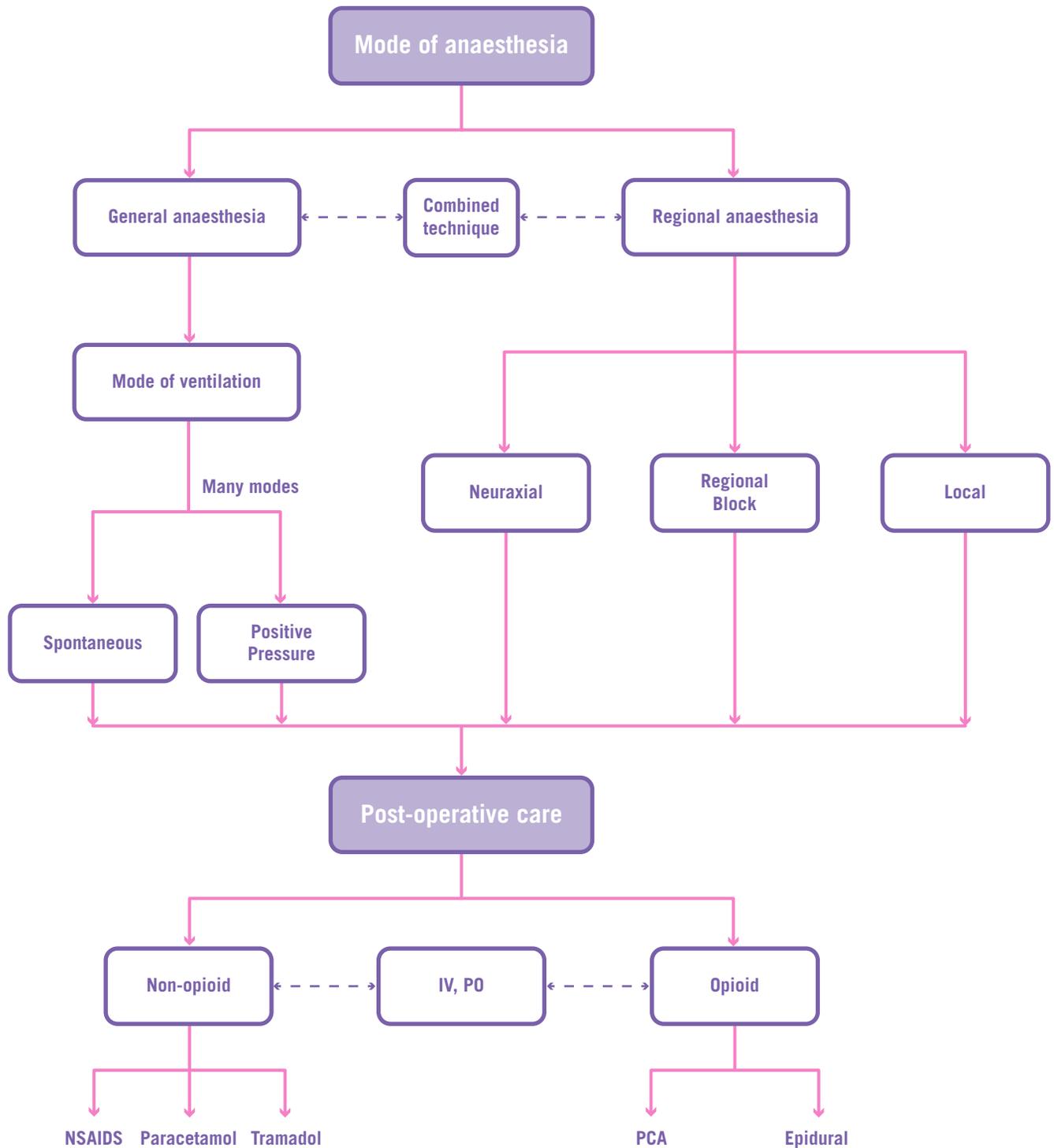
commonly cause anaesthesia of the affected area for several hours – however, some surgical procedures may require anaesthesia for a longer time period than this, thus resulting in a relative contraindication to this mode of anaesthesia. The advantage of regional anaesthesia is the minimisation of poly-pharmacy and the ability of the patient to eat and drink immediately postoperatively. There is also a decreased incidence of postoperative nausea and vomiting with a regional technique. To overcome any phobia of 'being awake' during the surgery, a combination of regional anaesthesia and intravenous sedation is often offered, which can be a difficult balancing act to titrate adequately – care is needed should this combination therapy be warranted.

A combination of a general anaesthetic with regional nerve blockade is also frequently discussed – the general anaesthesia providing anaesthesia for the duration of the surgery and the regional blockade allowing for good analgesia in the immediate postoperative period. This is a highly effective combined technique for the properly chosen surgery.



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IV – Intravenous

PO – Oral

PCA – Patient controlled analgesia

General anaesthesia: inhalational vs. TIVA vs. combination

Figure 1: Simplified anaesthesia decision tree.

Potential risks

Often, the choice of which mode of anaesthesia to use is a joint decision made between anaesthetist and patient and it is the experience of the Department of Anaesthesia here at Aspetar that most athletes prefer general as opposed to regional anaesthesia, citing a desire to avoid any potential nerve issues (neuropraxia or neuropathy) as a reason for this. However, the incidence of these complications to regional blockade remains low (0.04% after neuraxial blockade and up to 3% after peripheral nerve block). These problems are most often transient, lasting a few days to weeks only. However, any temporary 'patch of numbness' that may not be relevant or a concern to the non-athlete can be markedly debilitating to the elite athlete, thus adequate counselling and informed consent is necessary in each individual case.

Today, both general and regional anaesthesia are both very safe when performed proficiently, but nothing in medicine is ever risk free. Patients should be aware that risks with a **general anaesthetic** include:

- perioperative awareness,
- airway and dental trauma,
- failed airway,
- hypoxia,
- anaphylaxis,
- aspiration pneumonitis,
- cardiovascular collapse and
- cardiac arrest to name but a few.

Major risks with a **regional anaesthetic** include:

- failed technique,
- neurotoxicity,
- neuropraxia,
- neuropathy,
- infection or
- neuraxial haematoma.

PERIOPERATIVE CARE

There is a well-known analogy in the world of anaesthesia: if the patient can be thought of as an aeroplane, then the anaesthetist is the pilot, trying to fly the plane in a safe manner bypassing difficult and stormy weather. The surgeon, however, is the hijacker, doing everything he can do to crash the plane and cause the wings and the engine to fall off! A slightly extreme analogy, but it does illustrate the fact that any surgery that occurs is a huge insult to

the body. The anaesthetist's role is to ensure that the patient does not feel this insult and that the surgery is completed in a timely and efficient manner, with minimal distress or deviation from physiological normality. This involves the manipulation of the patient's cardiovascular, respiratory and endocrine systems and the administration of poly-pharmaceutical agents to limit any problems and also to ensure adequate analgesia.

On the rare occasion that an adverse event should occur, there needs to be a rapid and efficient response. Life-threatening arrhythmias, anaphylaxis, inadvertent extubation and inability to ventilate patients are just a few of the myriad of pitfalls that can trip up the unobservant anaesthetist. Constant vigilance is the key, and constant care and obsessive checking and monitoring remain the cornerstones of anaesthesia care.

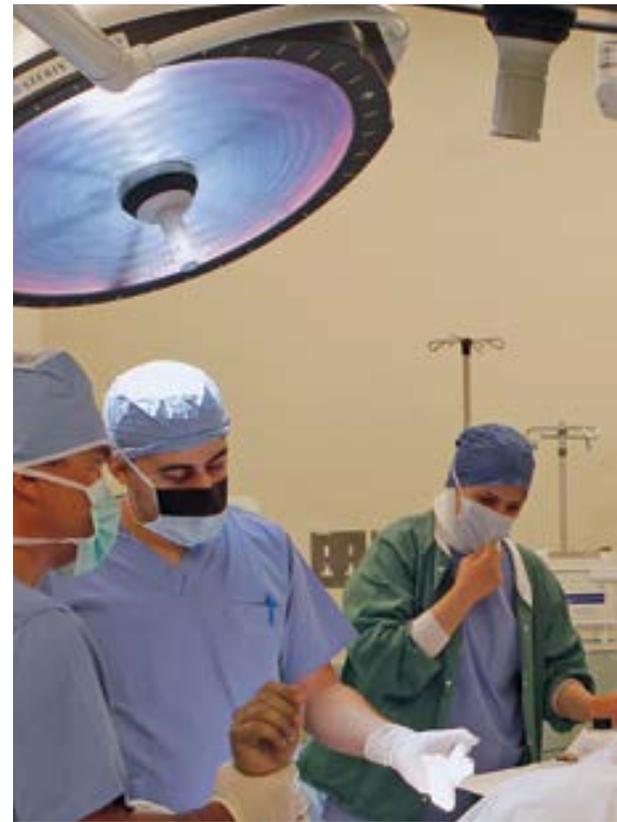
With the elite athlete, the most common concern is one of cardiovascular status – frequently the left ventricle is hypertrophied with related ECG changes and large stroke volume and bradycardias. These can manifest in arrhythmias and occasionally ventricular standstill, which is more than just a 'concern' to anyone who has witnessed it! Forewarned is forearmed however, and a good armoury of agents such as atropine, glycopyrrolate, ephedrine or adrenaline should always be close to hand.

There have been several well-documented episodes of sudden cardiac death of footballers during matches and this is the nightmare scenario for which all anaesthetists should be prepared for while caring for the elite athlete under general anaesthesia. The added pressure is the knowledge that the world's media would descend and dissect all aspects of the anaesthesia milieu should this tragic event ever occur.

POSTOPERATIVE MANAGEMENT

It has been postulated that athletes have an altered pain tolerance compared to non-athletes. There are currently two theories:

1. Athletes have a *decreased* pain tolerance and threshold due to the impact of training and an increase in the amount of circulating endorphins while training. This causes down-regulation of nociceptors and therefore after surgery there is an increased need for large amounts of analgesia.



2. Athletes have an *increased* pain tolerance and threshold due to the impact of training and an increase in the amount of circulating endorphins while training. The same down-regulation occurs, but after injury there may be a decrease in regular physiological endorphin release due to lack of regular exercise. This may cause a rebound up-regulation of receptors – thus athletes may require less analgesia due to the fact that they are 'opioid-sensitive'.

This discrepancy is borne out in the hospital setting – there is a very variable analgesic requirement in the athlete after any operation. Some require increased analgesia whilst others hardly require any analgesia at all. Many medications used in the peri-anaesthetic period are on the WADA banned list, so their use – if the athlete's are tested – will require either a Therapeutic Use Exemption (TUE) form or a formal medical report.

A major issue in the immediate postoperative period is the perceived need for the athlete to rehabilitate in as short a time as possible. There can be both internal and external pressures to do this. This can cause increased problems with postoperative pain due to increased physiotherapy and increased exercise in an attempt to return to full fitness and full training before the



body is truly healed. With athletes more than with the 'average' patient, the adage, "the mind is willing but the body is weak" needs to be borne in mind. Athletes also have a tendency to under-score on pain scales in an attempt to return to play as soon as possible. However, if at all possible, it is important to co-ordinate postoperative care with important upcoming events and matches.

The use of deep vein thrombosis prophylaxis is essential if there is any possibility of recent steroid usage or prolonged immobility or prolonged surgical time – a thrombosis or pulmonary embolus can be life-threatening and at the very least, delay full training by several weeks to months after an operation. This treatment may also need to be prolonged if air travel is planned in the early postoperative period.

SUMMARY

The elite athlete has unique challenges for all medical personnel involved in their care – and anaesthetists are no exception. Physiological, psychological and sociological factors are all different and important to optimise prior to this event in an athlete's career. The ability to pre-empt any concerns and complications is vital to allow the athlete to return to play in as short a time

as possible. This is a stressful time in an athlete's life and being able to make it as short – and as stress-free – as possible is one of the aims of the anaesthetic teams involved.

Anaesthesia is now very safe, with a mortality of less than 1 in 250,000. It is a speciality that is always striving for the ultimate zero complications, because any complication is one complication too many and any slip up can have dire consequences. This is true for all patients, but should the untoward happen to a well-known elite athlete, such is today's society that those involved will be very much under the spotlight. And that is a spotlight that nobody would like to be in – especially anaesthetists who are generally shy people and prefer to avoid any sort of spotlight!

Further reading

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