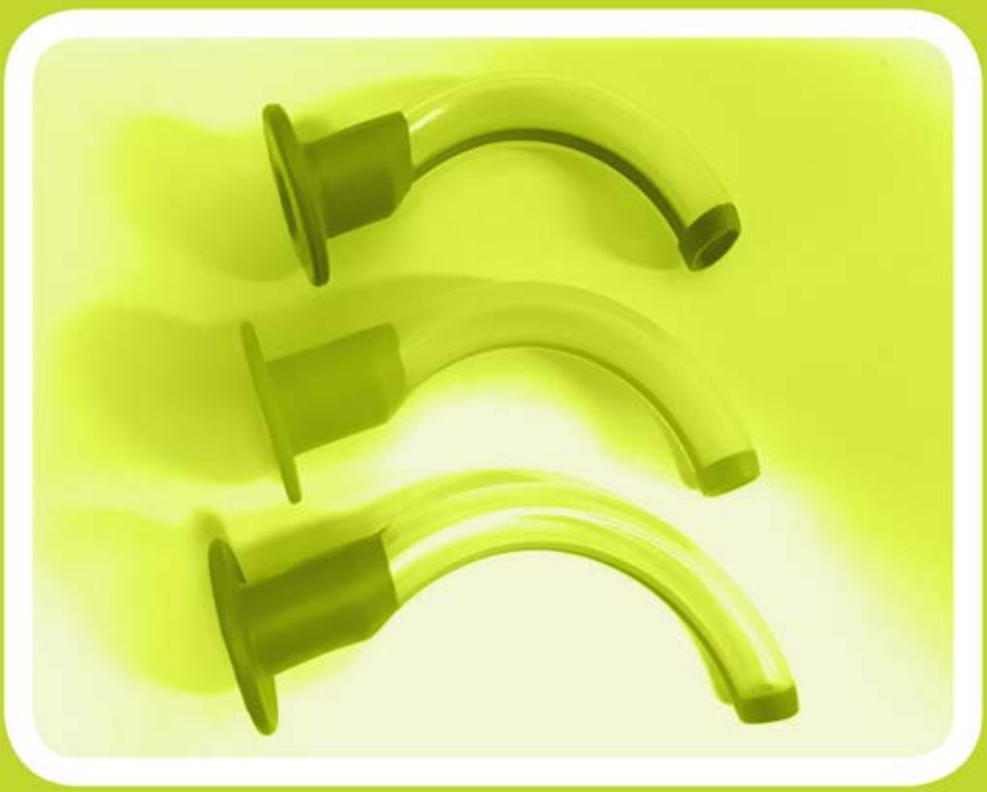
Final FRCA:
60 CRQs

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Paper 2

2.1 Aortic stenosis

2.2 Myotonic dystrophy

2.3 Delirium in the intensive care unit

2.4 Major obstetric haemorrhage

2.5 Child protection

2.6 Assessment and management of pain in special groups

2.7 Malignant hyperthermia

2.8 Awake tracheal intubation

2.9 Remote anaesthesia and transcatheter aortic valve implantation

2.10 Lower limb regional anaesthesia

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2.1 Aortic stenosis

Questions

A 73 year old male is admitted to the coronary care unit with dyspnoea, lethargy and haemodynamic instability. A chest X-ray demonstrates pulmonary congestion and an echocardiogram confirms the diagnosis of severe aortic stenosis.

A. Complete the table below with the relevant causes of aortic stenosis. (3 marks)

Description	Cause of aortic stenosis
Most common cause in those over 70 years	
Most common cause in those under 70 years	
Name 1 other cause	

B. Complete the table below with the appropriate values for quantifying aortic stenosis on echocardiography. (6 marks)

Degree of aortic stenosis	Mean gradient (mmHg)	Aortic valve area (cm^2)
Normal		
Mild		
Severe		

The patient makes some improvement with medical management, including diuresis, but a decision is made to proceed to an interventional procedure.

C. Name 2 interventional catheter lab options available for this patient. (2 marks)
1.....
2.....

It is finally decided that the patient will undergo open aortic valve replacement surgery via full sternotomy.

D. Give 4 ways to maintain haemodynamic stability when anaesthetising a patient with severe aortic stenosis. (4 marks)
1.....
2.....
3.....
4.....

In the operating theatre, following implantation of the new valve, satisfactory de-airing of the heart and rewarming of the patient, the ECG shows complete heart block at a rate of 30 beats per minute.

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E. What is the next step that must be undertaken by the surgeon and anaesthetist prior to separation from bypass? (1 mark)

.....

F. Complete the table below by naming 1 disadvantage for each of the following modes of pacing. (3 marks)

Mode of pacing	Disadvantage
AAI	
VVI	
DDD	

The patient undergoes successful surgery, but subsequently requires placement of a removable orthodontic brace at his dental practice. He asks whether antibiotic prophylaxis is required for this dental work.

G. What advice should he be provided with? (1 mark)

.....

Answers

A.

Description	Cause of aortic stenosis
Most common cause in those over 70 years	Calcification
Most common cause in those under 70 years	Congenital bicuspid aortic valve
Name 1 other cause	Rheumatic fever, systemic lupus erythematosus

Explanation

The aortic valve consists of three cusps, the right coronary cusp, left coronary cusp and the non-coronary cusp. By far, the most common cause of aortic stenosis is age-related calcification, which accounts for at least half of all cases. In severe cases, the calcification can be so profuse that some of the leaflets may appear fused. The second most common cause is a congenital bicuspid valve, which affects around 2% of the population. 50% of patients with this condition can expect to have some degree of valve stenosis by the 5th decade of life. There are numerous other rarer causes. A previous history of rheumatic fever earlier in life can suggest this as the potential culprit.

B.

Degree of aortic stenosis	Mean gradient (mmHg)	Aortic valve area (cm^2)
Normal	<5.0	<3.0
Mild	5.0–25.0	1.5–3.0
Severe	>50.0	<1.0

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Explanation

A variety of echocardiographic criteria are used to quantify the severity of stenotic and regurgitant valvular pathologies. For aortic stenosis, the aortic valve area and mean gradients are commonly used methods, the values of which are found in the table. All anaesthetists should be aware of these values and be able to interpret their significance, as patients with valve disease may present for any type of emergency or elective surgery. It is also important to be aware that pressure gradient measurements across the aortic valve may be inaccurate when left ventricular function is impaired. In these situations, it is preferable to use aortic valve area in assessing severity.

C.

1. Balloon aortic valvuloplasty (BAV)
2. Transcatheter aortic valve implantation (TAVI)

Explanation

In recent years, percutaneous interventions for heart valve disease have dramatically increased in popularity, and can offer safe and effective options for patients who would be otherwise not appropriate or too high risk for open surgery. BAV is a relatively quick procedure in the catheter lab utilising local anaesthesia and femoral access. It can be used in patients with severe and symptomatic aortic stenosis or those with haemodynamic instability as a bridge to TAVI or open surgery. Well over 100,000 TAVI procedures have now been performed worldwide. The preferable approach is via transfemoral access as this is the least invasive and the majority can be performed under local anaesthesia with or without sedation. If the femoral vascular access is not suitable, there are a variety of other techniques such as transapical (combined approach with surgeons using mini-thoracotomy) or transcaval, which may necessitate deeper sedation or general anaesthesia.

D.

1. Induction with cardiostable drugs, such as high-dose opioids or benzodiazepines
2. Maintenance of preload
3. Avoidance of tachycardia
4. Maintenance of sinus rhythm
5. Maintenance of systemic vascular resistance

Explanation

Patients with severe and symptomatic aortic stenosis are amongst the most high-risk patients presenting for anaesthesia. Tachycardia should be avoided as time is needed for diastolic coronary blood flow and blood to eject through the stenotic valve orifice. Sinus rhythm is always preferable to maintain atrioventricular synchrony and ventricular filling. Maintenance of systemic blood pressure and vascular resistance is vital to avoid the viscous cycle that occurs when hypotension leads to myocardial ischaemia and hence worsening haemodynamics. Invasive arterial line monitoring should also be established before induction of anaesthesia to guide the above.

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E.

Placement of epicardial pacing wires and establishment of pacing at an appropriate rate, such as 70–100 beats per minute

Explanation

One of the prerequisites prior to separation from cardiopulmonary bypass is an adequate heart rate. Heart block, of any severity, is common following cardiopulmonary bypass, especially during aortic valve surgery, and a heart rate of 30 beats per minute is not compatible with safe separation. Temporary epicardial pacing leads must therefore be placed by the surgeon, and the anaesthetist should set the pacing box to an appropriate mode and rate. Heart rates at the upper end of normal are preferable because right ventricular function, which may be more compromised from cardiopulmonary bypass, is best within this range.

F.

Mode of pacing	Disadvantage
AAI	Cannot be safely used in atrioventricular node dysfunction or heart block, as impulses will not travel satisfactorily to the ventricle
VVI	Least physiological mode as atrial component to ventricular filling is lost
DDD	Requires two leads to be surgically attached to the epicardium, increasing the risk of bleeding

Explanation

In general, temporary epicardial pacing for cardiac surgical patients involve a wire attached either to a single chamber (usually right ventricle, occasionally right atrium) or sometimes to two chambers (right ventricle and right atrium). In pacing nomenclature, the first letter represents the chamber paced, the second letter the chamber sensed and the third letter the response to sensing. Single-chamber ventricular pacing is probably the most commonly used during cardiac surgery, but can cause haemodynamic compromise as the atrial component to ventricular filling is lost. Regular checks should therefore be made to see if the patient has reverted to his own sinus rhythm. Single-chamber atrial pacing is occasionally used but must only be done so if atrioventricular conduction is entirely normal. It is important to acknowledge that pacing wires can be the source of bleeding and cardiac tamponade requiring resternotomy, and placement of two wires in dual-chamber pacing obviously increases this risk.

G.

The patient should be told that he does not require any antibiotic prophylaxis for this procedure

Explanation

In 2008, the National Institute for Health and Clinical Excellence (NICE) published guidance on antimicrobial prophylaxis against infective endocarditis in adults

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and children undergoing interventional procedures. This stated that antibiotic prophylaxis is not needed for patients undergoing dental procedures, including those who are at an increased risk of endocarditis, such as patients with congenital heart disease or those with valve replacements. In 2016, following evidence that the incidence of endocarditis had increased since 2008, the recommendation was subtly changed to include the word routinely: 'antibiotic prophylaxis against infective endocarditis is not recommended routinely for people undergoing dental procedures'. This provides the clinician with extra scope to consider prescribing antibiotics for patients undergoing high-risk dental procedures which involve gingival manipulation, such as root canal treatment. Lower risk procedures, such as removable braces or dental X-rays, do not require antibiotic prophylaxis.

Further reading

Thornhill M, Dayer M, Lockhart PB, McGurk M, Shanson D, Prendergast B. A change in the NICE guidelines on antibiotic prophylaxis. Br Dent J 2016; 221:112–114.

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2.2 Myotonic dystrophy

Questions

A 35 year old male presents for an elective laparoscopic cholecystectomy. He was diagnosed with myotonic dystrophy 10 years ago.

A. Name 4 clinical manifestations of myotonic dystrophy. (4 marks)
1.....
2.....
3.....
4.....

B. How is it inherited? (2 marks)
.....
.....

C. In addition to routine investigations for this case, what other investigations would be prudent? (4 marks)
.....
.....
.....
.....

D. What concerns related to the airway may you have? (2 marks)
.....
.....

E. What 2 intra-operative monitoring devices would you consider in this patient? (2 marks)
1.....
2.....

F. Name 2 drugs which you would avoid in the intra-operative period. (2 marks)
1.....
2.....

He is successfully extubated after the operation.

G. What 4 interventions would help prevent postoperative complications? (4 marks)
1.....
2.....

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3.....
4.....

Answers

A.

1. Incomplete muscle relaxation, such as inability to let go after hand grip
2. Muscle wasting
3. Respiratory, such as obstructive sleep apnoea (OSA) or restrictive lung disease
4. Cardiac abnormalities, such as cardiomyopathy, conduction defects or structural abnormalities
5. Endocrine dysfunction, such as diabetes mellitus or hypothyroidism
6. Intellectual impairment

Explanation

Myotonic dystrophy is an inherited disorder with an approximate incidence of 4 per 100,000 of the population. It is manifested by multisystem signs and symptoms from adolescence to early adulthood. The underlying pathology is related to abnormal sodium and chloride channels and the muscle is in an abnormal excitable state, resulting in repetitive action potentials, sustained muscular contraction and the inability for the muscle to relax.

B.

Autosomal dominant

Explanation

Myotonic dystrophy is an autosomal dominant condition with the primary locus being on chromosome 19.

C.

1. ECG
2. Echocardiogram
3. Pulmonary function tests
4. Venous bicarbonate or arterial blood gas

Explanation

Patients with myotonic dystrophy are at a significant risk of both cardiac conduction defects and structural abnormalities. Although not routine for either this age of patient or type of surgery, it is important that any cardiac dysfunction is assessed and investigated fully by a cardiologist. These patients may warrant the insertion of permanent cardiac pacemakers or defibrillators as they are prone to bradyarrhythmias and tachyarrhythmias. Echocardiography is useful to assess left ventricular function, presence of cardiomyopathy and evidence of right heart failure, all of which are significant problems in these patients. Respiratory muscular disease is common and pulmonary function tests can reveal restrictive lung defects. Pulmonary function tests

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can provide risk stratification for patients prior to surgery and be used as an indicator of those who are likely to require postoperative ventilation and prolonged intensive care stay. Patients with myotonic dystrophy are at a risk of blunted effects of both hypoxaemia and hypercarbia. There may be evidence of hypercapnia prior to induction of anaesthesia and this is an important marker of disease severity. In addition, patients may have chronic hypercarbia as a result of OSA. It is important that any symptoms of OSA are screened for and, if necessary, investigated. If arterial blood gas analysis is not immediately available, serum venous bicarbonate can be used.

D.

- Difficult intubation, such as narrow face or limited mouth opening
- Increased risk of aspiration

Explanation

Patients with myotonic dystrophy can present with a difficult airway due to narrow face, high arched palates and limited mouth opening. There is also an increased risk of aspiration in these patients owing to pharyngeal muscular weakness, gastrointestinal dysmotility and reflux. Many advocate the use of prokinetics and sodium citrate prior to induction of anaesthesia. Secondary to the risk of aspiration, a rapid sequence induction and the use of cricoid pressure should be considered in these patients. There are case reports of the successful use of supraglottic airway devices, but these should be used with caution.

E.

1. Arterial blood pressure monitoring
2. Temperature monitoring
3. Neuromuscular blockade

Explanation

Due to the high risk of cardiac dysfunction and sensitivity to anaesthetic agents, arterial blood pressure monitoring should be considered. The further benefits of arterial blood sampling include biochemical and acid–base correction in patients who are prone to hyperkalaemia and acidaemia. Moreover, electrolyte disturbances can predispose to myotonias. Temperature control is critical as they are at an additional risk of intra-operative hypothermia which can worsen myotonia. Both continuous temperature monitoring and warming devices, such as fluid warmers, force air warmers devices and warming mats, are important in the intra-operative and postoperative phases. Shivering can also induce a myotonic contracture in the postoperative phase, so this needs to be limited if at all possible. Due to the unpredictable effects of neuromuscular-blocking agents and reversal with neostigmine, dutiful monitoring of neuromuscular blockade and return of function is important in these patients. The electrical stimulus itself from the monitoring device, however, can induce myotonia and be misinterpreted as an indication of reversed neuromuscular function.

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F.

1. Suxamethonium
2. Neostigmine
3. Long-acting opioids (caution rather than contraindication)

Explanation

Suxamethonium is contraindicated in patients with myotonia as it has unpredictable effects, can lead to masseter spasm and intractable laryngospasm, and exacerbate myotonia. In addition, it may result in significant life-threatening hyperkalaemia in severe cases. Endotracheal intubation should be attempted, wherever possible, without nondepolarising muscle relaxants. If nondepolarising agents are required, however, short-acting muscle relaxants should be used. Long-acting opioids should be administered with caution, if at all, in patients with myotonic dystrophy. Patients are incredibly sensitive to their effects and there have been resultant fatalities from systemic and neuraxial opioids. Opioids tend to further have exacerbated effects on the gastrointestinal dysmotility.

G.

1. Chest physiotherapy
2. Incentive spirometry
3. Multimodal analgesia
4. Early mobilisation

Explanation

The risk of anaesthesia in myotonic dystrophy is most significant in the postoperative period. The majority of postoperative complications are secondary to respiratory dysfunction, with an increased risk of postoperative atelectasis, hypoventilation and pneumonia. Decreased pre-operative vital capacity is likely to predict postoperative respiratory complications, warranting prolonged ventilation and intensive care management. All patients who undergo anaesthesia with myotonic dystrophy should be managed in an area which is able to provide continuous monitoring for at least 24 hours. Evidence suggests the use of chest physiotherapy and incentive spirometry to reduce the risk of atelectasis and pneumonia. Multimodal analgesia and the cautious use of systemic opioid medication facilitate improved respiratory function and decrease the risk of hypoventilation.

Further reading

Schieren M, Defosse J, Böhmer A, Wappler F, Gerbershagen MU. Anaesthetic management of patients with myopathies. Eur J Anaesthesiol 2017; 34:641–649.

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