orphananesthesia

Anaesthesia recommendations for patients suffering from

Marfan syndrome

Disease name: Marfan syndrome

ICD 10: Q87.4

Synonyms: Marfan's syndrome

Marfan syndrome is an autosomal dominant, multisystem disease with a reported incidence of 1 in 3,000 to 5,000 individuals. There is a broad range of clinical severity associated with Marfan syndrome, ranging from isolated features to neonatal presentation of severe and rapidly progressive disease. Classic manifestations involve ocular (lens dislocation, myopia), cardiovascular (aortic root dilatation with aortic regurgitation, mitral valve prolapse with mitral regurgitation), and musculoskeletal abnormalities (long bone overgrowth, scoliosis, kyphosis, joint hypermobility), however involvement of the lung (pneumothorax), skin (striae), and central nervous system (dural ectasia) is also common in Marfan syndrome. Mutations in the gene (FBN1) that encodes the extracellular matrix protein, fibrillin-1, cause classic Marfan syndrome. However, up to 30% of cases have neither parent affected and represent de novo mutations. Prophylactic treatment with beta blockers is considered the standard of care in adults (unless contraindicated) and has been shown to reduce the rate of aortic dilatation. There is no definitive recommendation for either general or regional anaesthesia. Regardless of anaesthetic technique, care should be taken to prevent sudden increase in myocardial contractility, producing an increase in aortic wall tension, which could lead to aortic dissection.

Medicine in progress

Perhaps new knowledge

Every patient is unique

Perhaps the diagnostic is wrong

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Typical surgery

Literature review is limited to case reports/case series of patients presenting for surgical treatment of scoliosis, retinal detachment, orthodontic surgery, caesarean delivery, aortic root replacement, elective repair of thoracic aortic aneurism, and emergency repair of aortic dissection. Patients with Marfan syndrome have increased incidence of inguinal, femoral and umbilical hernia, recurrent pneumothoraces, requiring surgical treatment, as well as arthropathies, severe pectus deformities, necessitating orthopaedic correction.

Type of anaesthesia

There is no definitive recommendation for either general or regional anaesthesia. A distinct advantage of general anaesthesia is that, if acute dissection should occur, the airway is protected and immediate cardiac surgery is possible. Disadvantages of general anaesthesia include the risk of hypertensive response to intubation, which could predispose to aortic dissection, if not prevented pharmacologically. There are no contraindications for sedation in these patients, however in patients with significant pulmonary disease (emphysema, restrictive lung disease due to scoliosis) this technique should be considered with caution.

Necessary additional diagnostic procedures (preoperative)

Cardiac investigations such as echocardiography or cardiac magnetic resonance imaging (MRI) should be ordered preoperatively to rule out cardiac or aortic pathology. Left ventricular dilation may predispose to alterations of repolarization and fatal ventricular arrhythmias and could be identified on echocardiogram. Patients with significant dilatation of aortic root should be referred to a cardiothoracic surgeon for evaluation of aortic root replacement prior to elective surgery. There have been case reports of caesarean delivery followed by repair of aortic dissection in parturients, therefore women with aortic dilatation >4cm, measured at the level of Valsalva sinuses, or history of aortic dissection should deliver in a centre where cardiovascular surgery is available. The 2010 ACC/AHA/AATS guidelines recommend elective operation for patients with Marfan syndrome at an external diameter of ≥5 cm to avoid acute dissection or rupture. Indications for repair at an external diameter less than 5 cm include rapid growth (>5 mm/y), family history of aortic dissection at a diameter less than 5 cm or presence of progressive aortic regurgitation. Prophylaxis against infective endocarditis in the presence of valvular abnormality is not required, unless the patient has a mechanical valve. Pulmonary blebs may be present with history of spontaneous pneumothoraces, therefore chest X-ray should be ordered preoperatively. Patients with severe scoliosis should undergo pulmonary function testing to evaluate the extent of restrictive lung disease. Due to the high prevalence (70% incidence in the lumbosacral area) of dural ectasia (increased diameter of the dural sac) in this patient population, MRI of the spine should be ordered prior to planning any neuraxial procedure, even in the absence of the symptoms (low back pain, headache, proximal leg pain, weakness and numbness above and below the knee, and genital/rectal pain).

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Particular preparation for airway management

High arched palate with crowded teeth may make vizualization of the larynx during direct laryngoscopy difficult. Clinically symptomatic cases of atlantoaxial dislocation in these patients are rarely reported in the literature and screening radiographs of cervical spine for patients with Marfan syndrome undergoing general anaesthesia are not routinely recommended. There is one case-report of tracheomalacia in a patient with Marfan syndrome manifested by increased airway pressures and difficulty with ventilation during anaesthesia in a prone position. Obstructive sleep apnoea has been reported in patients with Marfan syndrome, although there are no case reports describing difficulty managing the airway due to this comorbidity. Patients are at increased risk for developing pneumothorax, which should be kept in mind during positive pressure ventilation. Although there is a possibility of temporomandibular joint dysfunction, this condition has not been reported to cause difficulty with laryngoscopy. Excessive traction on laryngoscopy should be avoided to prevent temporomandibular joint dislocation. Cardiovascular response during laryngoscopy should be blunted pharmacologically.

Particular preparation for transfusion or administration of blood products

There is no evidence from the literature that patients with Marfan syndrome have pre-existing coagulation abnormalities associated with higher risk of blood transfusion. Patients requiring anticoagulation due to prosthetic valve or aortic root should be offered a bridging therapy prior to elective surgery.

Particular preparation for anticoagulation

There is no information suggesting the need for particular anticoagulation, except in patients following valve or aortic root replacement.

Particular precautions for positioning, transport or mobilisation

Patients must be carefully positioned and handled to avoid joint dislocations secondary to join laxity.

Probable interaction between anaesthetic agents and patient's long-term medication

Patients might be taking beta-blockers, angiotensin receptor blockers (ARB) for blood pressure control to minimize shear forces and wall stress in the aorta, diuretics (history of heart failure), and anticoagulants, if had valve or aortic root replacement in the past. Beta-blockers should be continued perioperatively. Potential adverse effects of perioperative beta blockade include bradycardia and hypotension. Continuing ARBs up to the time of surgery increases perioperative hypotension. Omiting diuretics in the morning of surgery minimizes hypovolemia and electrolyte disturbance.

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Anaesthesiologic procedure

Regardless of anaesthetic technique, care should be taken to prevent sudden increase in myocardial contractility, producing an increase in aortic wall tension. Labetalol and nitroglycerin should be available to treat hypertensive episodes, and haemodynamically stable induction should be performed. This could be achieved by using short-acting opioids like Remifentanil under target-controlled infusion regimen. Volatile anaesthetics have the potential to decrease the force of cardiac ejection, therefore decreasing the risk of aortic dissection. Phenylephrine is a vasopressor of choice, because ephedrine may induce tachycardia via its beta-adrenergic effect. Avoidance of excessive endogenous cathecholamine production through control of pain and anxiety is essential.

Antibiotic prophylaxis:

According to the latest AHA guidelines, patients with isolated valvular abnormality do not require antibiotic prophylaxis against infective endocarditis. If the patient has a history of prosthetic cardiac valve or a history of infective endocarditis in the past, preoperative antibiotic prophylaxis should be administered according to AHA guidelines. Antibiotic prophylaxis is recommended for all dental procedures that involve manipulation of gingival tissues or periapical region of teeth or perforation of oral mucosa, procedures on respiratory tract or infected skin, skin structures, or musculoskeletal tissue. The regimen for antibiotic administration in those cases might be either oral using Amoxicillin 2 g or intravenous with Ampicillin 2 IM or IV or Cefazolin or Ceftriaxone 1 g IM or IV. Patients allergic to penicillin or ampicillin could receive oral Cephalexin (or any other 1st or 2nd generation cephalosporin) 2 g, Clindamycin 600 mg, or Azithromycin or Clarithromycin 500 mg. Alternatively, parentheral Cefazolin or Cefrtiaxone 1 g IM/IV or Clindamycin 600 mg IM/IV could be used in patients with anaphylactic reaction to penicillin and ampicillin and unable to take oral medications. Procedures, requiring antibiotic prophylaxis for surgical wound infection prevention should utilize antibiotics effective against suspected pathogens. Antibiotic prophylaxis solely to prevent IE is not recommended for GU or GI tract procedures, as well as is not recommended for vaginal deliveries.

Particular or additional monitoring

An arterial line should be used intraoperatively to monitor for sudden changes in the blood pressure. The use of intraoperative transesophageal echocardiography to monitor aortic root diameter has been reported in several case reports. Central line placement is not necessary unless significant valvular dysfunction is present.

Possible complications

Patients with Marfan syndrome and left ventricular dilatation are at risk of ventricular arrthythmias. Aortic root diameter greater than 4 cm carries a risk of aortic dissection. Type 2 aortic dissections as classified by De Bakey is the commonest type seen in patients with Marfan syndrome. Spontaneous coronary artery dissection has been also reported in the literature.

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Postoperative care

Degree of postoperative monitoring depends on surgical procedure and the preoperative condition of the patient, particularly the size of aortic root and left ventricle. Intensive care is not mandatory.

Information about emergency-like situations / Differential diagnostics

caused by the illness to give a tool to distinguish between a side effect of the anaesthetic procedure and a manifestation of the diseases

Disease triggered emergency-like situations are not described in patients with Marfan syndrome. The symptoms of the most feared complication-aortic dissection are unlikely to be attributed to the side effect of the anaesthetic procedure.

Ambulatory anaesthesia

There are no reported experiences in patients with Marfan syndrome in the ambulatory anaesthesia setting. The author's opinion, is that low risk, minimally invasive surgery could be performed on patients with Marfan syndrome in the ambulatory setting, in the absence of significant involvement of cardiovascular and respiratory systems.

Obstetrical anaesthesia

All women with genetically proven Marfan syndrome should have counselling on the risk of dissection and the recurrence risk, and have a complete multidisciplinary evaluation including imaging of the entire aorta before pregnancy. Dissection occurs most often in the last trimester of pregnancy (50%) or the early postpartum period (33%). In all women with known aortic disease and/or an enlarged aortic root diameter, the risks of pregnancy should be discussed before conception. Aortic root diameter >4cm during pregnancy carries a higher risk of dissection (10% compared to 1% in patients with aortic root diameter <4 cm) and conception is not advised if the root diameter is >4.5 cm. Depending on the aortic diameter, patients with aortic pathology should be monitored by echocardiography at 4–12 week intervals throughout the pregnancy and 6 months post-partum because aortic root enlargement may be accelerated by pregnancy. Pregnancy should be supervised by a cardiologist and obstetrician who are alert to the possible complications. Instrumented vaginal delivery can be safely performed in patients with Marfan syndrome who have no cardiovascular involvement or stable minimal aortic dilatation (<4 cm). Epidural analgesia is strongly recommended to minimize stress associated with labour pain. Cesarean delivery is indicated in patients with an aortic diameter >4.5 cm, aortic dissection, severe aortic regurgitation or heart failure. Cesarean delivery should also be considered in the presence of contraindications for epidural analgesia for vaginal delivery or epidural analgesia has failed, to avoid the stress on the dilated aortic root, caused by untreated labour pain. For patients with aortic root diameter 4.0-4.5 cm decision about the method of delivery should be individualized and involve multidisciplinary team approach, including an obstetrician, anaesthesiologist and cardiologist. Family history of dissection, rapid growth during pregnancy should be taken into account. It is essential to continue beta-blocker therapy during pregnancy, peripartum and postpartum period to prevent aortic dissection.

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Management of anticoagulation during pregnancy:

Parturients with Marfan syndrome will only require anticoagulation, if there they have a mechanical valve. Women with well functioning prosthetic valves tolerate pregnancy well from haemodynamic point of view. Yet the need for anticoagulation raises specific concerns because of an increased risk of valve thrombosis, of haemorrhagic complications, and of offspring complications. According to the European Society of Cardiology guidelines, oral anticoagulants (OAC) could be continued during the 1st trimester if the required dose of warfarin is <5mg/day. If the dose is >5 mg, discontinuation of OAC between weeks 6 and 12 and replacement by adjusted-dose UFH (a PTT ≥2× control; in high risk patients applied as intravenous infusion) or LMWH twice daily (with dose adjustment according to weight and target anti-Xa level 4-6 hours post-dose 0.8-1.2 U/mL) is recommended. If OAC are continued through the 2nd and 3rd trimester, at 36 weeks of gestation they should be replaced by either dose-adjusted UFH (a PTT ≥2× control) or adjusted-dose LMWH (target anti-Xa level 4-6 hours post-dose 0.8-1.2 U/mL). In pregnant women managed with LMWH, the post-dose anti-Xa level should be assessed weekly. LMWH should be replaced by intravenous UFH at least 36 hours before planned delivery. UFH should be continued until 4-6 hours before planned delivery and restarted 4-6 hours after delivery if there are no bleeding complications. Normal aPTT after discontinuation of IVUFH should be confirmed prior to performing neuraxial procedure.

Both regional and general anaesthesia have been used successfully in parturients undergoing cesarean delivery. Neuraxial anaesthesia may pose technical challenges due to kyphoscoliosis. The standard dose of local anaesthetic required for the spinal anaesthesia might be inadequate due to the presence of dural ectasia, therefore combined spinal epidural anaesthesia might be a technique of choice for caesarean delivery. Local aesthetic without epinephrine is preferable for epidural anaesthesia in case of accidental intravascular injection. Although dural ectasia is not an absolute contraindication for epidural anaesthesia, the theoretical risk of increased incidence of dural puncture or inadequate anaesthesia should be discussed with the patient. Structural changes in the ligamentum flavum have been suggested as a likely cause of accidental dural puncture. Ultrasound examination of the back prior to placing an epidural catheter may decrease the risk of puncture of the enlarged dural sac. Ascending and descending aortic dissection has been reported in postpartum period in parturients with Marfan syndrome, therefore symptomatic women should undergo immediate investigations. Asymptomatic patients still need to undergo an echocardiographic examination prior to hospital discharge.

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