Anaesthesia for the adult patient with rheumatoid arthritis

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Hippocrates mentioned joint ailments in his medical treatises around 400 yr B.C.; at that time 'gout' was used to describe all types of arthritis. However, the first description of rheumatoid arthritis in the medical literature is generally accorded to Augustin Jacob Landré-Beauvais in 1800 who described rheumatoid arthritis (RA) as 'asthenic gout' which exhibits several distinctive features, including predominance in women, a chronic course, involvement of many joints from the onset and a decline in general health.¹ RA is now known to be a chronic systemic inflammatory disorder characterized by deforming symmetrical polyarthritis of varying extent and severity, associated with synovitis of joint and tendon sheaths, articular cartilage loss and erosion of juxta-articular bone.² Still's disease is the commonest type of juvenile chronic arthritis affecting children. This article will focus on adult patients with RA presenting for anaesthesia and surgery.

Epidemiology and aetiology

RA affects about 1-2% of the UK population. It is three times more common in women than men with a peak onset between 30 and 55 yr. The initiating cause of RA remains unknown, but several factors may contribute. Approximately 70% of cases are associated with the HLA-DR4 subtype, and 80% of patients are seropositive for Rheumatoid factor. Environmental factors also seem to play a role, including as yet unidentified viral or bacterial agents. Other risk factors associated with the development of RA include female gender, a family history of RA, food allergies and intolerances, altered gut flora, psychological stress, exposure to heavy metals and cigarette smoking.

Clinical features

General features

Clinical features include a symmetrical pattern of joint pain (worst in the morning, improving with activity), morning stiffness, fatigue, weight loss, general malaise, depression and disability. The predominant signs are soft tissue swelling, warmth, tenderness on pressure or movement, limitation of movement, deformities and nodules. Severe symptoms tend to occur in episodes lasting weeks or months, between which patients may be relatively asymptomatic. Repeated episodes lead to progressive joint damage and severe disability in 10% of patients. Commonly affected joints include the wrists, fingers, neck, shoulders, elbows, hips, knees, ankles and feet. Extra-articular manifestations occur in >50% of patients overall; those particularly relevant to anaesthesia involve the cardiovascular system, lungs, skin, eyes, bone marrow, kidneys and nerves (Table 1).

 Table I
 Extra-articular manifestations of rheumatoid arthritis relevant to anaesthesia

System/organ	Key points relevant to anaesthesia
Cardiovascular	Daricandial offusions
	pericarditis and cardiac
	tamponade
	Myocarditic amyloidosic and
	granulomatous disease
	Endocarditis and left
	ventricular failure
	Peripheral vasculitis and
	Raynaud's phenomenon
	Increased atherosclerosis and
	coronary heart disease
Respiratory	Restrictive defect
	(fibrosing alveolitis)
	Rheumatoid nodules
	Reduced chest wall compliance
	(costochondral disease)
	Pleural effusions
Haematological	Normocytic normochromic
	anaemia
	Iron deficiency anaemia (peptic
	ulceration and bleeding)
	Bone marrow depression from
	drug treatment
Hepatic and renal	Chronic renal failure from drug
	treatment (approx 25%)
	Hepatomegaly, splenomegaly
	Increased serum fibrinogen and
	alpha-1 acid glycoprotein
	Decreased serum albumin
Neurological and ocular	Peripheral neuropathy
	Autonomic dysfunction
	Kerato-conjunctivitis

Key points

Rheumatoid arthritis affects I–2% of the UK population; it is a chronic systemic inflammatory disorder.

A thorough preoperative assessment including history and physical examination is essential to assess the extent and severity of the disease.

Airway and neck assessment is crucial; atlanto-axial subluxation may be present and there is a potential risk of spinal cord damage.

Awake fibreoptic intubation may be required for airway management.

Regional anaesthesia should always be considered as an alternative to general anaesthesia.

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The following features are of relevance to anaesthesia.

Cervical spine

The atlanto-axial joint is commonly affected in RA because of attenuation of the transverse ligament and erosion of the odontoid peg. This can lead to atlanto-axial instability in about 25% of patients suffering from RA. Acute subluxation may cause spinal cord compression and/or compression of the vertebral arteries leading to quadriparesis or sudden death. There are two main categories of cervical spine instability: atlanto-axial subluxation and subaxial subluxation.

Atlanto-axial subluxation:

Four subtypes have been described.

- i. *Anterior* (affecting up to 80% of patients with atlanto-axial subluxation). The C1 vertebra moves forward on C2 because of destruction of the transverse ligament and there is a risk of spinal cord compression by the odontoid peg. Views of the lateral cervical spine in flexion may demonstrate subluxation (Fig. 1). Subluxation exists when the distance between the atlas and the odontoid peg exceeds 4 mm in patients older than 44 yr and 3 mm in younger patients. Anterior atlanto-axial subluxation is worsened by neck flexion.
- ii. *Posterior* (affecting about 5% of patients with atlanto-axial subluxation). Destruction of the odontoid peg may cause backward movement of C1 on C2, which may be evident on lateral extension views of the neck. Posterior atlanto-axial subluxation is worsened by neck extension.
- iii. Vertical (accounts for about 10–20% of atlanto-axial subluxation). Destruction of the lateral mass of C1 can lead to subluxation of the odontoid peg through the foramen magnum and compression of the cervico-medullary junction.
- iv. *Lateral or rotatory subluxation* results from degenerative changes in the C1/C2 facet joints. It can lead to spinal nerve compression and vertebral artery compression.

Other deformities

Subaxial subluxation is uncommon and occurs below C2. It leads to earlier symptoms of nerve compression. In addition, ankylosis of the C-spine may lead to fixed flexion deformity of the neck while osteoporosis may be worsened by the regular use of steroids.

Airway

Involvement of the cricoarytenoid joints may result in dyspnoea, stridor, hoarseness and occasionally severe upper airway obstruction.³ Patients with cricoarytenoid RA may present with a mass in the larynx, which can cause significant destruction of the surrounding structures.⁴ Laryngeal amyloidosis and rheumatoid nodules may also cause obstruction of





Fig. 1 (A) Neck extension and (B) neck flexion. Note the position of dens axis (arrow). There is a 13 mm dislocation between the dens and the main body of the axis. C3 shows degenerative changes. This patient had been receiving long-term steroid treatment.

the larynx. The temporomandibular joint (TMJ) may be involved causing limitation of mouth opening and render direct laryngoscopy impossible.

Involvement of other organs

The main organs affected with relevance to anaesthesia are shown in Table 1.

Effects of pharmacotherapy

The main groups of drugs currently available for the management of RA include those giving symptomatic relief,

	Key adverse effects relevant to anaesthesia
Drugs providing symptomatic relief	
Corticosteroids	Hypertension, electrolyte imbalance, diabetes, obesity, peptic ulcer disease, fragile skin, adrenal suppression
NSAIDs	Heart failure, hypertension, gastric bleeding and ulceration, nephrotoxicity, fluid retention, increased perioperative bleeding
Disease-modifying anti-arthritis drugs	
Sulphasalazine	Neutropenia, thrombocytopenia, aplastic anaemia, fibrosing alveolitis
Methotrexate	Pulmonary toxicity, hepatic cirrhosis
Chloroquine	Retinopathy, neuromyopathy, cardiomyopathy
Azathioprine	Cholestatic hepatitis, bone marrow suppression
Cyclosporin	Nephrotoxicity, hypertension, tremor
Gold	Thrombocytopenia, bone marrow suppression, pulmonary fibrosis, hepatotoxicity, nephrotic syndrome, proteinuria
Penicillamine	Bone marrow suppression, haemolytic anaemia, nephrotic syndrome, myasthenia-like syndrome
Anti-cytokine agents (Biological agents)	
Etanercept (binds TNF)	Flu-like symptoms, blood disorders, demyelinating disorder of the CNS
Infliximab (anti-TNF antibody)	Associated with development of TB at extrapulmonary sites, chest and abdominal pain
Adalimumab (anti-TNF antibody)	Flu-like symptoms, abdominal pain, cough, light-headedness
Anakinra (blocks activity of IL-1)	Flu-like symptoms, diarrhoea, nausea, neutropenia thrombocytopenia

Table 2 Drug therapy in rheumatoid disease

corticosteroids, disease-modifying anti-rheumatic drugs (DMARDs) and biological agents, including the new anticytokine drugs. In severe cases, patients may be receiving longterm opioid analgesic medication. Some of the important adverse effects of drug treatment are shown in Table 2.

Anaesthetic management

Preoperative assessment

Patients with RA may require orthopaedic surgery as part of their treatment or they may present for other types of surgery unrelated to RA. A thorough preoperative assessment is crucial to assess the extent and severity of the disease including history and physical examination. In particular, the anaesthetist must assess the range of neck flexion and extension, TMJ mobility and mouth opening. The range of movement of other joints should be noted so as to optimize patient position during and after surgery. Preoperative neurological deficits should be documented.

Preoperative investigations will depend upon the nature and degree of organ involvement. A full blood count, urea and electrolytes, ECG and chest X-ray are recommended in most cases. Other investigations that may be required depending on the systemic manifestations present include CRP, liver function tests, lung function tests, arterial blood gas analysis, echocardiography or imaging of the cervical spine.

Investigations

Cervical spine X-ray

Cervical spine X-rays should be obtained after a careful clinical assessment on an individual patient basis. It has been recommended that all patients with RA should undergo preoperative X-ray screening for cervical spine instability⁵ and that anaesthetic management should be tailored depending on the X-ray findings to minimize the risk of neurological and vascular

complications. A more pragmatic approach is that patients with pain radiating to the occiput (the earliest and most common symptom), paraesthesia to shoulders and arms with head movement, or painless sensory loss in the hands should have a complete flexion/extension cervical spine X-rays, interpreted by a senior radiologist.

Occasionally in an emergency situation, or in unconscious patients with known RA, flexion/extension cervical spine X-rays may be impractical and in this case the rheumatoid cervical spine should be regarded as unstable and treated accordingly.

MRI scan

An MRI scan of the neck is indicated in cases where neurological signs are present, in patients with severe pain and also if significant abnormality is noted on the plain X-ray films. It is more accurate than X-ray in demonstrating nerves and soft tissues of the cervical spine. Spinal cord compression and spinal canal involvement are also best seen with an MRI and the position of the odontoid peg in relation to the medulla and brainstem can be visualized. Unfortunately, MRI scans may not be available, especially if surgery is urgent.

ENT consultation

Fibreoptic nasopharyngoscopy is indicated for patients with hoarseness because of the likelihood of cricoarytenoid involvement, which may make endotracheal intubation difficult or may lead to postoperative exacerbation of symptoms.

Intraoperative management

Vascular access

Vasculitis, thin and fragile skin can render establishment of i.v. access difficult. Central venous catheters may be difficult to insert because of limited neck movement. The radial artery may be inaccessible because of flexion deformities of the wrist joint.

Regional or local anaesthesia

It may be possible to perform surgery under regional or even local nerve blockade. In general terms, regional or local anaesthesia should be used wherever acceptable and possible. Upper limb surgery may be performed under brachial plexus block and lower limb surgery performed under spinal, epidural or in some cases plexus or specific nerve blockade. Regional or local anaesthesia have the advantages of avoiding both neck and airway manipulation and also the systemic effects of drugs used for general anaesthesia.

Many patients with RA are receiving long-term medication with NSAIDS but this has not been shown to increase the risks of epidural/spinal haematoma; the American Society of Regional Anaesthesia has endorsed the view that central neuraxial block in such patients is safe.⁶ However, local anaesthetic nerve blocks can be technically challenging because of loss of anatomical landmarks from contractures and flexion deformities. Similarly, spinal and epidural anaesthesia may be technically difficult or impossible especially in cases where the lumbar and thoracic spines are involved in the disease process.

Managing the airway

If GA is performed, the airway may be managed in several ways. The Guedel airway and a face mask may be sufficient. The laryngeal mask airway (LMA) may also be used. It may be difficult to insert an LMA if the angle between the oral and pharyngeal axes at the back of the tongue is less than 90°; a reinforced LMA may be preferable in such circumstances.

The decision to perform tracheal intubation will depend on an assessment of the risks of gastric aspiration, and the type and duration of surgery. If tracheal intubation is indicated, this must be achieved without causing further injury to a potentially unstable cervical spine. Manipulation of the neck from the neutral position can lead to neurological deterioration, tetraplegia and even sudden death and thus should be avoided.⁷ The recommended 'sniffing' position for laryngoscopy, whereby the head is hyperextended on a flexed neck can result in exacerbation of the anterior atlanto-axial subluxation with resultant neurological injury⁸; meticulous care should be taken during conventional laryngoscopy and neck manipulation in all patients with RA, even without overt cervical spine instability.

An intubating LMA (ILMA) may be used to achieve blind endotracheal intubation with minimal cervical spine movement. However, the poor success rate without the use of fibreoptics and the great amount of force that may be exerted on the posterior wall of the pharynx at C2–C3 make the ILMA less attractive as a primary method of intubation.

Fibreoptic intubation has improved the safety of airway management in surgical patients with RA.⁹ Where intubation is anticipated to be difficult because of cervical spine instability, TMJ disease or a reduction in neck movement, an awake fibreoptic intubation and positioning of the C-spine is highly recommended.¹⁰ However, an awake fibreoptic intubation is

not without problems and depends on the skill of the operator. Under urgent or emergency conditions, fibreoptic techniques have considerably less success.

A surgical tracheostomy performed under local anaesthesia is another method of securing the airway of patients with cricoarytenoid involvement.³ Potential difficulties with this method include the presence of an extreme fixed flexion deformity with little or no access to the trachea, tracheal deviation and patient distress.

Other important factors

Positioning of the patient should be meticulous and all pressure areas padded to avoid pressure sores. Methylcellulose eye drops should be applied as up to 15% of patients with RA suffer from kerato-conjunctivitis sicca and are at risk of corneal ulceration. Consideration should be given in positioning the patient awake before induction of general anaesthesia.

Full aseptic technique for establishing i.v. access, epidural/ spinal blocks, arterial and CVP-line and urinary catheter is mandatory as these patients may be at increased risk of infections from immunosuppressive drug treatment.

Long-term steroid therapy causes adrenal suppression and patients taking an equivalent dose greater than prednisolone 10 mg daily require steroid cover.¹¹ Blood glucose concentrations should be monitored closely and controlled with insulin if necessary. Patients taking steroids and NSAIDs are at risk of developing gastro-intestinal tract bleeding and should receive gastric acid prophylaxis.

Postoperative management

The same considerations regarding patient positioning and neck movement apply at emergence from anaesthesia as with intubation. Transferring the patient from the operating table to a bed should be as gentle as possible. Increased sensitivity to anaesthetic agents may occur and, depending on the patient's condition and the nature of surgery, the patient may need ITU/HDU care. Cricoarytenoid inflammation may occur, necessitating tracheostomy.³

The use of patient-controlled analgesia systems may be impossible in severe rheumatic hand disease; in such cases an alternative analgesia strategy is required. Patients are at increased risk of respiratory complications so physiotherapy, breathing exercises and mobilization should be instituted early. Renal function should be monitored carefully in view of the possibility of pre-existing impairment, the effects of medication and perioperative fluid shifts.

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Please see multiple choice questions 17-21.