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## Review Article

# Anesthetic management in orthopaedic surgery for rheumatic patients

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## ABSTRACT

Patients with rheumatic diseases frequently require orthopaedic surgeries due to progressive joint damage and deformities. These patients pose unique challenges for anesthesiologists due to systemic involvement, altered anatomy, and chronic pain management needs. This review explores optimal anesthetic strategies to improve surgical outcomes and enhance patient safety in this vulnerable population. Preoperative assessment is crucial for identifying systemic manifestations of rheumatic diseases, including cardiovascular, respiratory, and renal involvement, which can significantly impact anesthetic management. A thorough evaluation helps tailor the anesthetic plan to individual patient needs, ensuring better perioperative care.

Regional anesthesia, particularly neuraxial blocks and peripheral nerve blocks, offers significant benefits over general anesthesia in this population. These techniques can reduce postoperative pain, enhance recovery times, and decrease opioid consumption. However, the presence of spinal deformities and anticoagulation therapy in these patients requires careful consideration and meticulous planning. Multimodal analgesia, combining regional techniques with systemic medications, is recommended to manage chronic pain and minimize opioid use postoperatively. Effective pain management strategies are essential for improving postoperative outcomes and patient satisfaction.

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## 1. Introduction

Rheumatic diseases, including rheumatoid arthritis, osteoarthritis, and ankylosing spondylitis, represent a significant health burden, leading to progressive joint damage and functional impairment. As these conditions advance, many patients require orthopaedic surgical interventions such as joint replacements and corrective surgeries to alleviate pain and restore mobility. However, the presence of systemic involvement, chronic pain, and anatomical alterations in these patients poses unique challenges for anesthesiologists.<sup>1-4</sup>

Effective anesthetic management is crucial in optimizing surgical outcomes and enhancing patient safety. Rheumatic diseases often affect multiple organ systems, including the

cardiovascular, respiratory, and renal systems, necessitating a thorough preoperative assessment to identify and address potential complications. Additionally, the chronic use of medications, such as corticosteroids and disease-modifying antirheumatic drugs (DMARDs), can influence anesthetic planning and perioperative care.<sup>5,6</sup>

Regional anesthesia, particularly neuraxial and peripheral nerve blocks, has emerged as a preferred approach for many orthopaedic procedures in patients with rheumatic conditions. These techniques offer several advantages over general anesthesia, including reduced postoperative pain, lower opioid requirements, and improved recovery times. However, administering regional anesthesia to patients with rheumatic diseases requires careful consideration of factors such as spinal deformities and anticoagulation status.

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## 2. Incidence of Rheumatic Cases Undergoing Orthopaedic Surgery in India

Rheumatic diseases are a significant public health concern in India, affecting millions of individuals across various age groups. These diseases, encompassing rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, and other inflammatory and degenerative joint conditions, often lead to severe joint damage and disability, necessitating surgical interventions. The increasing prevalence of these conditions in India has correspondingly led to a rise in the number of rheumatic patients requiring orthopaedic surgery.<sup>6,7</sup>

Prevalence of Rheumatic Diseases in India: Rheumatoid arthritis (RA) and osteoarthritis (OA) are among the most common rheumatic conditions in India. Epidemiological studies estimate that RA affects approximately 0.5-1% of the adult population, with a higher prevalence in women. OA, particularly of the knee, is even more prevalent, affecting about 22-39% of the population over the age of 50. Ankylosing spondylitis, though less common, is also a significant concern, particularly among young adults, affecting approximately 0.03-0.35% of the population.

### 2.1. Rising demand for orthopaedic surgery

The burden of rheumatic diseases is reflected in the growing number of orthopaedic surgeries performed in India. Joint replacement surgeries, including hip and knee arthroplasties, are among the most common procedures. According to recent data, the number of knee replacement surgeries has increased significantly, with estimates suggesting over 150,000 procedures performed annually. Similarly, hip replacement surgeries are also on the rise, driven by the aging population and increased diagnosis of rheumatic conditions.<sup>8,9</sup>

### 2.2. Factors contributing to increased surgical interventions

**Aging Population;** The increasing life expectancy and aging population in India result in a higher prevalence of degenerative joint diseases like OA, necessitating surgical interventions. **Improved Diagnostic Capabilities;** Advances in medical diagnostics and greater awareness of rheumatic diseases have led to earlier and more accurate diagnoses, increasing the number of patients eligible for surgical treatment. **Advancements in Surgical Techniques;** Innovations in surgical techniques and prosthetic materials have improved the outcomes of orthopaedic surgeries, making them a viable option for more patients. **Access to Healthcare;** Enhanced access to healthcare services, including specialized orthopaedic and rheumatology centres, has facilitated the treatment of rheumatic patients with surgical needs. **Increased Urbanization and Lifestyle Changes;** Urbanization and sedentary lifestyles contribute to the rising incidence of obesity and joint wear and

tear, further driving the demand for joint replacement surgeries.<sup>10-13</sup>

## 3. Airway Management Among Rheumatoid Arthritis Patients

Rheumatoid arthritis (RA) is a chronic inflammatory disorder primarily affecting the joints but also presenting systemic manifestations that complicate airway management during anesthesia. Anesthesiologists must be aware of these challenges to optimize perioperative care and ensure patient safety. The main challenges arise due to changes in the cervical spine, temporomandibular joint (TMJ), and larynx in patients with RA.<sup>14-17</sup>

### 3.1. Cervical spine involvement

RA can cause significant cervical spine changes, such as atlantoaxial subluxation (AAS), basilar invagination, and subaxial subluxation. AAS involves instability between the first and second cervical vertebrae. Neck manipulation during intubation can exacerbate instability, potentially leading to spinal cord compression or injury. Basilar invagination in which the odontoid process moves upward into the foramen magnum, compressing the brainstem and upper spinal cord. Subaxial subluxation displacement of the vertebrae below the axis further contributes to spinal instability. To manage such conditions, detailed imaging studies, such as cervical spine X-rays, CT, or MRI, to assess the degree of instability and plan for safe airway management. Use of manual in-line stabilization or fiberoptic intubation to reduce neck manipulation. One should consider awake fiberoptic intubation to maintain patient control and allow for neurological assessment during intubation.

### 3.2. Temporomandibular Joint (TMJ) involvement

RA can affect the TMJ, leading to limited mouth opening (microstomia) and restricted jaw movement. This can complicate laryngoscopy and intubation; difficulty in inserting laryngoscope blades and positioning endotracheal tubes. Restricted jaw movement pose challenges in achieving adequate visualization of the vocal cords. One should assess TMJ function and mouth opening and plan for alternative intubation techniques. We can use fiberoptic bronchoscopy or video laryngoscopy to aid in visualization and tube placement. Use of supraglottic airway devices if intubation is particularly challenging.

### 3.3. Laryngeal involvement

RA can cause cricoarytenoid arthritis, leading to vocal cord fixation and airway narrowing. Symptoms include hoarseness, stridor, and difficulty breathing. Inflammation and fixation of the cricoarytenoid joint can cause partial

or complete airway obstruction. Evaluation for signs of airway obstruction, such as hoarseness or stridor. One should be prepared with alternative airway management strategies, including fiberoptic intubation and tracheostomy. Close observation for airway obstruction due to edema or worsening joint inflammation.

#### 4. Drug Interactions in Rheumatoid Arthritis Patients Undergoing Anesthesia

Rheumatoid arthritis patients often require complex pharmacotherapy to manage their condition, including disease-modifying antirheumatic drugs, biologics, corticosteroids, and nonsteroidal anti-inflammatory drugs. These medications can interact with anesthetic agents, affecting both the efficacy and safety of anesthesia. Understanding these interactions is crucial for anesthesiologists to optimize perioperative care and avoid complications.<sup>18,19</sup>

DMARDs, including methotrexate, leflunomide, sulfasalazine, and hydroxychloroquine, are commonly used to control RA progression. These drugs can interact with anesthetic agents in several ways. Chronic use of methotrexate can lead to hepatotoxicity, which may alter the metabolism of anesthetic drugs. It can also cause bone marrow suppression, increasing the risk of perioperative infection and delay wound healing. Anesthetic considerations include, Regular monitoring of liver function tests and blood counts is essential. Avoid hepatotoxic anesthetic agents if liver dysfunction is present. Similar to methotrexate, leflunomide can cause hepatotoxicity and immunosuppression. Liver function and immune status should be assessed preoperatively. Caution with hepatotoxic and immunosuppressive agents. Sulfasalazine, can cause blood dyscrasias and hepatotoxicity. One should monitor complete blood count and liver function tests. Be cautious with drugs that can further depress bone marrow function. Hydroxychloroquine is generally well-tolerated, but can cause retinopathy and cardiomyopathy with long-term use. Preoperative cardiac evaluation may be warranted in long-term users.

Biologic agents, such as tumor necrosis factor (TNF) inhibitors (e.g., infliximab, adalimumab) and interleukin inhibitors (e.g., tocilizumab), are effective in controlling RA but pose risks of immunosuppression and infection. Increased risk of perioperative infections due to immunosuppression. One should consider timing of the last dose to minimize immunosuppressive effects during the perioperative period. Close monitoring for signs of infection and use of prophylactic antibiotics as needed.

Corticosteroids, such as prednisone, are frequently used in RA for their anti-inflammatory effects. Chronic use can lead to adrenal suppression, hyperglycemia, osteoporosis, and increased infection risk. There is a increased risk of adrenal insufficiency necessitates perioperative stress-

dose steroids to prevent adrenal crisis. Monitoring of blood glucose levels and manage perioperatively to prevent hyperglycemic complications. Patients on corticosteroids are at risk of fractures; handle patient carefully during positioning and intubation.

NSAIDs, including ibuprofen and naproxen, are commonly used for pain management in RA. They can affect renal function, platelet aggregation, and gastrointestinal integrity. One should assess kidney function preoperatively, as NSAIDs can exacerbate renal impairment. Patient will be at increased bleeding risk; hence one should avoid drugs that further impair coagulation. There will be an increased risk of gastrointestinal bleeding.

Patients on other drugs like on opioids for chronic pain management, may lead to tolerance and potential for higher perioperative opioid requirements. One should titrate opioid dosing carefully, considering potential for tolerance and dependence. Most of the RA patients will be suffering with comorbid illness and will be on treatment like antihypertensives, oral hypoglycemic drug or on insulin therapy. Based on the type of anaesthesia the continuation or discontinuation of these drugs should be planned.

#### 5. Positioning of Rheumatoid Arthritis Patients for Anesthesia

Rheumatoid arthritis significantly impacts joints and surrounding tissues, leading to deformities, stiffness, and pain, which pose unique challenges in positioning patients for anesthesia. Proper positioning is crucial to ensure patient safety, minimize discomfort, and avoid exacerbating existing joint issues. This detailed discussion focuses on the specific considerations and strategies for positioning RA patients undergoing anesthesia.<sup>20</sup>

##### 5.1. Challenges in positioning RA patients

Patients with RA often present with complex joint deformities and a limited range of motion, particularly in the hands, feet, knees, and cervical spine. These deformities can complicate the process of positioning for anesthesia, as standard positions may not be feasible or may cause significant discomfort. Chronic pain and stiffness, common in RA, can be exacerbated by improper positioning, leading to increased perioperative pain and potential complications. Additionally, cervical spine involvement is a frequent issue in RA patients, with conditions such as atlantoaxial subluxation and subaxial subluxation posing significant risks. These cervical spine abnormalities require careful handling to avoid neurological damage during positioning.

##### 5.2. Preoperative assessment and planning

A thorough preoperative assessment is essential for understanding the extent of a patient's joint involvement and deformities. This assessment should include a detailed

evaluation of the cervical spine, as well as other affected joints. Imaging studies such as X-rays, CT scans, or MRIs can provide valuable information about the degree of joint damage and instability, particularly in the cervical spine. Understanding a patient's pain levels, range of motion, and any specific concerns they may have about positioning is also crucial. Based on this assessment, an individualized positioning plan should be developed. This plan should consider the patient's specific joint limitations and deformities, aiming to maximize comfort and minimize the risk of injury. Collaborating with the surgical team, physical therapists, and the patient's rheumatologist can provide additional insights and help in devising a safe and effective positioning strategy.

### 5.3. Positioning techniques and considerations

When positioning RA patients for anesthesia, several key considerations must be addressed. For patients with significant cervical spine involvement, maintaining neck stability is paramount. Techniques such as manual in-line stabilization or the use of a cervical collar can help prevent further instability and protect the spinal cord during intubation and surgery. In cases of severe cervical spine deformities, fiberoptic intubation may be preferable to minimize neck movement. For patients with limited range of motion in the upper and lower extremities, gentle handling and the use of padded supports are crucial to avoid exacerbating pain and stiffness. The use of pillows, foam pads, and other supportive devices can help maintain joint alignment and comfort. For example, placing a pillow under the knees can alleviate tension in the lower back and reduce discomfort for patients with knee deformities. Patients with RA often have fragile skin and soft tissues due to chronic inflammation and prolonged corticosteroid use. This increases the risk of pressure sores and skin breakdown. Ensuring adequate padding and frequent repositioning during longer procedures can help mitigate these risks. Special attention should be given to bony prominences, and the use of pressure-relieving devices, such as gel pads or air-filled cushions, can be beneficial. In cases where joint deformities are particularly severe, custom positioning devices may be necessary. These devices can be tailored to the patient's specific anatomy, providing optimal support and minimizing discomfort. Additionally, continuous monitoring of the patient's positioning throughout the procedure is essential to detect and address any issues promptly.

### 6. Postoperative Considerations

After the procedure, careful attention must be paid to the patient's positioning during recovery. Ensuring that the patient is comfortable and that joints are properly supported can help reduce postoperative pain and prevent complications. Pain management strategies

should be tailored to the individual's needs, incorporating both pharmacologic and non-pharmacologic approaches to address chronic pain and stiffness. Patient education on proper positioning techniques and the use of supportive devices at home can also be beneficial in the postoperative period. Providing resources and guidance on maintaining joint health and managing pain can improve overall outcomes and enhance the patient's quality of life.

### 7. Conclusion

Effective anesthetic management in orthopedic surgery for rheumatic patients requires a multidisciplinary approach, thorough preoperative assessment, and careful planning to address the unique challenges posed by joint deformities, chronic pain, and drug interactions. Tailoring anesthesia techniques to individual patient needs, with a focus on minimizing neck and joint manipulation, is crucial for patient safety and comfort. Ongoing collaboration among anesthesiologists, rheumatologists, and surgeons is essential to optimize perioperative care and improve outcomes for this vulnerable patient population. By addressing these complexities, we can enhance the surgical experience and overall health of patients with rheumatoid arthritis.

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### 9. Conflict of Interest

None.

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