

CASE REPORT

## Sugammadex use in difficult intubation due to ankylosing spondylitis and severe restrictive respiratory disease

### *Ankilozan spondilite bağlı ağır solunum yetmezliği ve zor entübasyon vakasında sugammadex kullanımı*

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#### ABSTRACT

We describe anesthesia management of a 50-year-old man scheduled for thoracic spinal reconstruction, presenting with severe restrictive respiratory disease and difficult airway due to ankylosing spondylitis. The patient was unable to extend his head, had difficulty in breathing and sleeping in supine position due to thoracic deformities. The patient was intubated using intubating laryngeal mask airway to overcome the difficulties of limited mouth opening and head extension. He was extubated following administration of sugammadex to obtain optimal conditions in terms of respiratory muscle function and to prevent hypersecretion and bronchospasm. *J Clin Exp Invest* 2012; 3 (3): 398-400

**Key words:** Restrictive lung disease, airway management, laryngeal masks, sugammadex, ankylosing spondylitis

#### INTRODUCTION

Ankylosing spondylitis (AS) is a chronic, progressive, otoimmune disease characterised by granulation tissue infiltration into ligaments and joint capsules.<sup>1</sup> The male-to-female ratio of ankylosing spondylitis is 3:1. HLA-B27 genotype is expressed in approximately 90% of patients. In 40% of cases, the temporomandibular joint is involved, limiting mouth opening.<sup>2-4</sup> Involvement of cervical spines limits head extension and can make intubation by direct laryngoscopy extremely difficult or impossible.<sup>1</sup> Most common sites of involvement are sacroiliac joints and the spine.

Granulation tissue infiltration into joints causes difficulty in intubation.<sup>2-4</sup> Several guidelines and suggestions are present in the literature aiding in management of difficult airway in AS patients. We

#### ÖZET

Bu yazıda, torasik spinal rekonstrüksiyon operasyonu planlanan, ankilozan spondilite bağlı ağır restriktif akciğer hastalığı ve zor entübasyon bulguları gösteren 50 yaşında erkek hastanın anestezi yönetimi tartışıldı. Torakal deformite nedeniyle hastanın baş ekstansiyonu kısıtlı, supin pozisyonda uyuma ve nefes almada zorluk çekiyor. Ağız açıklığında ve baş ekstansiyonundaki kısıtlılık nedeniyle hasta larengeal maske kullanılarak entübe edildi. Bronşiyal sekresyonlarda artış ve bronkospazmı önlemek, solunum kaslarının fonksiyonunu optimum düzeyde geri döndürmek için sugammadex uygulamasını takiben ekstübe edildi.

**Anahtar kelimeler:** Restriktif akciğer hastalığı, havayolu yönetimi, larengeal maske, sugammadex, ankilozan spondilit

presented a difficult intubation case carrying a risk of postoperative pulmonary insufficiency and discussed its management.

#### CASE REPORT

A 50-year-old man scheduled for posterior thoracic spinal reconstruction due to back pain. His medical history included AS for fourteen years, anatomical deformities beginning ten years before and severe restrictive lung disease. He took non-steroidal anti-inflammatory agents to treat his back pain, had no history of allergy to any medication and smoked twenty cigarettes per day for 35 years. He was 168 cm tall and weighed 83 kg, could not extend his head, and had difficulty in breathing in supine position. The anteroposterior diameter of his chest was increased. His mouth opening was two cm, thyro-

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mental distance was three cm and had a mallampathy score of four. Pulmonary function tests revealed FVC: 1869 ml (37%), FEV1:1786(45%), FEV1/FVC: 95% suggesting severe restrictive lung disease. Laboratory analysis revealed an arterial blood gas pH: 7.36, pO<sub>2</sub>: 60 mmHg, pCO<sub>2</sub>: 43 mmHg, SpO<sub>2</sub>: 94 %, erythrocyte sedimentation rate 60 in the first hour and C-reactive protein level of 3.1 mg/l.

Due to thoracic spinal reconstruction, general anesthesia was planned. The patient rejected awake fiberoptic intubation and informed consent for a possible tracheotomy was obtained. Routine monitorization of electrocardiogram, SpO<sub>2</sub> and non-invasive blood pressure was applied. Neuromuscular function was monitored using TOF-Watch®-SX (Organon, Dublin, Ireland). The patient was placed in the semi-fowler position and preoxygenated for 3 minutes using a tight fitting face mask while breathing 100% oxygen at a rate of 5 l/min. Anesthesia was induced with propofol 2 mg/kg and fentanyl 1.5 mg/kg intravenously (iv). Neuromuscular blockade was provided with rocuronium 0.6 mg/kg iv. Upon reaching a T1 value of 0% in TOF-Watch®-SX, the patient was intubated using an intubating laryngeal mask airway (ILMA). Anesthesia was maintained with nitrous oxide/oxygen (FiO<sub>2</sub>: 0.5) and sevoflurane 2% inspired concentration with controlled ventilation. Neuromuscular blockade was maintained with supplemental doses of rocuronium 0.15 mg/kg iv while monitoring the state of neuromuscular function.

In the end of the surgery, which lasted approximately four hours, the patient was moved into the supine position. Upon reaching a T4/T1 ratio of 50%, sugammadex 2 mg/kg iv was administered. T4/T1 ratio reached 90% in 85 seconds and the patient was extubated. After an uneventful period of two hours in the post anesthesia care unit, he was transferred to the surgical ward. He recovered well and was discharged from the hospital seven days later.

## DISCUSSION

Ankylosing spondylitis resulting in granulation tissue deposition in ligaments and joint capsules, is a progressive form of inflammatory arthritis. Knee, hip and spinal reconstruction surgeries may be required in patients. While many of these procedures can be managed by regional anesthesia, cervical and thoracic reconstruction necessitates general anesthesia.<sup>5</sup> Regional anesthesia was successfully used during caesarean sections and lower extremity procedures, although difficult to perform due to spinal deformities.<sup>6,7</sup>

Patients with AS are at significant risk for postoperative pulmonary complications. Thoracic deformities cause restrictive pulmonary disease.<sup>8</sup> Radford and colleagues reported that mortality due to pulmonary complications is higher in AS patients.<sup>9</sup> Therefore cervical and temporomandibular joint radiographs to evaluate airway, pulmonary function test and arterial blood gas analysis to predict postoperative respiratory complications and echocardiogram to detect cardiac abnormalities were ordered during preoperative period.<sup>1</sup> Limitations of head extension and mouth opening can make intubation by direct laryngoscopy extremely difficult or impossible. Applying excessive force to extend the head during laryngoscopy may result in cervical and neurologic injury. This may be prevented by using an ILMA or flexible fiberoptic bronchoscope in cases where the patient rejects the safest option, which is awake intubation with local anesthesia.<sup>1</sup> Lu and colleagues reported that a total of 12 patients, each presenting with severe AS, were successfully intubated with ILMA.<sup>10</sup>

Although AS is not a disease of neuromuscular junction, residual neuromuscular blocking activity can be equally harmful for AS patients presenting with restrictive lung disease. Since our patient had a very low forced vital capacity, even a small amount of residual neuromuscular block could result in postoperative mechanical ventilation dependency. Therefore monitorization of neuromuscular function is required to prevent postoperative residual neuromuscular blockade. Nondepolarizing neuromuscular blocking agents are typically antagonized with cholinesterase enzyme inhibitors like neostigmine or pyridostigmine.<sup>11</sup> which may cause bradycardia, hypersalivation and bronchospasm.<sup>12</sup> Their inability to reverse deep neuromuscular blockade also restricts their use.<sup>13</sup> Sugammadex is a  $\gamma$ -cyclodextrine molecule designed to reverse neuromuscular blockade induced by steroidal nondepolarizing neuromuscular blocking agents.<sup>14</sup> Sugammadex encapsulates the circulating rocuronium molecules and lowers its concentration in plasma and subsequently at the motor end plate, resulting in rapid reversal of neuromuscular blockade.<sup>15</sup>

We used sugammadex to completely reverse rocuronium-induced neuromuscular blockade and experienced no postoperative pulmonary complications, despite the presence of severe restrictive pulmonary disease. In conclusion, we suggest that ILMA can be used to intubate AS patients with difficult airway and sugammadex may be used to prevent postoperative residual neuromuscular blockade.

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