



## Difficult Airway in Diabetes

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The incidence of diabetes continues to grow both in the United States and internationally. It is estimated by the International Diabetes Federation that 382 million people worldwide are currently diagnosed with the disease and that the prevalence will nearly double by 2030.<sup>1,2</sup> Based on these statistics, diabetes is one of the most common endocrine disorders that the anesthesiologist will encounter in practice.

Airway management is of paramount concern in every anesthetic. The American Society of Anesthesiologists (ASA) has defined a difficult airway as, “the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with facemask ventilation of the upper airway, difficulty with tracheal intubation, or both.”<sup>3</sup> In 2013, the ASA updated the practice guidelines from 2003 for the management of the difficult airway. It has been estimated that the incidence of difficult airways in the general population may be as high as 4.5 - 7.5%.<sup>4</sup>

It has been previously suggested that diabetic patients may be at higher risk for a difficult airway than the general population. In this mini review, we will discuss the potential for difficult laryngoscopy in this patient population since many of these patients will require surgical interventions due to complications of their medical pathophysiology.

### Should the Anesthesiologist Anticipate a Difficult Airway in a Patient with Type 1 Diabetes?

Type 1 diabetics make up only a small portion of the total number affected by the disease, but it is one of the most common chronic diseases of childhood.<sup>5</sup> In the United States, the incidence of type 1 diabetics in non-Hispanic white children and adolescents is 23.6 per 100,000 people per year and varies based upon geography, age, gender, family history, and ethnicity.<sup>6</sup>

In a 1988 paper from *Anesthesia and Analgesia*, Hogan *et al.* described an increase incidence of difficult laryngoscopies in type 1 diabetic patients undergoing renal transplants when compared to non-diabetic patients (32% vs 2.7%).<sup>7</sup> They defined difficult laryngoscopy as an airway in which an attending anesthesiologist was unable to directly visualize any part of the vocal cords using conventional direct laryngoscopy. In the majority of cases the endotracheal tube was passed blindly, or the patient was awakened and a fiberoptic scope was used. In an attempt to determine a possible cause for their results, the authors noted a subset of type 1 diabetics suffering from diabetic stiff joint syndrome (SJS), also known as limited joint mobility (LJM) syndrome. This is a disease process by which microvascular disease leads to abnormal cross-linkage of collagen by non-enzymatic glycosylation in connective tissue as a result of chronic hyperglycemia.<sup>8</sup> The au-

thors theorized that the involvement of the atlanto-occipital joint in diabetic SJS might ultimately lead to difficult laryngoscopy.<sup>7</sup>

A more recent retrospective study by Warner *et al.* reviewed the same patient population and similarly found that type 1 diabetic patients were more prone to difficult laryngoscopy (4.8% vs 1.0%).<sup>9</sup> They concluded that their results show, “patients with diabetes may have a modestly increased difficulty of laryngoscopy compared with those without diabetes, but they do not support the findings of greatly increased difficulty previously reported” and that “extraordinary techniques were not required to successfully manage their airways.”<sup>9</sup>

### Do Type 2 Diabetics Have the Same Likelihood of Difficult Laryngoscopy as Type 1 Diabetics?

The prevalence of type 2 diabetes continues to rise, and as stated earlier, is projected to double by the end of the next decade.<sup>1,2</sup> It is seen more frequently in developed nations where populations have a greater likelihood to be overweight and battle obesity.<sup>10</sup> Once largely thought of as a disease that only affected adults, it is now being seen more frequently in children and adolescents.<sup>6</sup> The sequelae of the disease are far reaching, affecting nearly every organ system, and ultimately causing excess mortality. Anesthesiologists, serving as perioperative physicians, will care for patients with type 2 diabetes on a near daily basis. It is important to be well versed in not only the end organ complications of the disease, but also the airway issues that may be encountered in this patient population.

A 2003 prospective study from Erden *et al.* showed a statistically significant increase in difficult laryngoscopy (18.75% vs 2.5%) in type 2 diabetics vs non-diabetics.<sup>11</sup> They defined difficult laryngoscopy as grade III and grade IV views based on Cormack-Lehane criteria.<sup>12</sup> Vani *et al.* similarly found the incidence of difficult laryngoscopy (Cormack-Lehane grade III or IV view) in type 2 diabetics to be 16%.<sup>13</sup>

In addition to studying the incidence of difficult laryngoscopy in type 2 diabetics, the Erden and Vani *et al.* studies also attempted to establish a relationship between difficult laryngoscopy and the ability of patients to approximate the palmar surfaces of their phalangeal joints, previously described as the “prayer sign” or “palm print sign.” The premise of the prayer sign or palm print sign is to grade the laxity of the phalangeal joints and establish a correlation between palmar joint rigidity and involvement of cervical and laryngeal tissues of diabetic patients that can lead to difficult laryngoscopy. As described earlier, diabetic patients are believed to have non-enzymatic glycosylation of collagen, which is subsequently deposited in the joints. This process can

lead to diabetic SJS. Changes from this disease process can first be noted in the fourth and fifth interphalangeal joints and later in the atlanto-occipital joint.<sup>11</sup> Diabetic SJS causes patients to have the inability to make a complete palmar approximation, despite maximal effort. Erden *et al.* were unable to show a relationship between the inability to complete the prayer sign and the likelihood of difficult laryngoscopy.<sup>11</sup> Vani *et al.* found that the palm print sign had the highest sensitivity in ability to predict difficult laryngoscopy preoperatively compared to other commonly used predictors of difficult intubation.<sup>13</sup> A recent study by Baig *et al.* demonstrated that the prayer sign had a lower sensitivity but similar specificity to Mallampati grade in predicting difficult laryngoscopy in the diabetic population.<sup>14</sup>

Though diabetes is frequently considered a predictor for difficult intubation, the incidence of difficult intubation in this patient population is likely less than originally thought and may actually be only slightly higher than the population at large. It must also be noted that the original studies were done at a time when traditional direct laryngoscopy or awake fiberoptic intubation were the methods used to manage an airway. Today, with the assistance of the devices such as the intubating supraglottic airway and video laryngoscopes, the rate of successful intubation in diabetic patients may actually be equivalent to that of the general population. To our best knowledge, this has not been formally studied.

The ability to predict difficult intubation by specific clinical exam findings continues to be debated in the literature.<sup>11, 13-14</sup> While the possibility of difficult intubation should always be considered in the diabetic population, other elements must be taken into consideration. A thorough preoperative evaluation should include a review of previous anesthetics and degree of difficulty of airway management, disease severity and control, as well as disease duration. Following the initial clinical history, a thorough airway evaluation, possibly including the prayer sign, is critical. If a difficult airway is suspected, appropriate preparations should be made including necessary rescue equipment and additional staff nearby. As with all cases, the ASA difficult airway algorithm must be used to guide management decisions.

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