Section A -Research paper

Topical Anesthesia in Upper Gastrointestinal Endoscopy: Review Article

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Article History: Received: 26.05.2023 **Revised:** 28.06.2023 **Accepted:** 16.07.2023

ABSTRACT

Patients undergoing upper gastrointestinal endoscopy (UGIE) commonly receive procedural sedation for comfort and to facilitate the procedure . Upper gastrointestinal endoscopy with procedural sedation carries the risk of several airway incidents and/or adverse events (AIAE). Topical pharyngeal anesthetics (TPAs) can blunt the airway reflexes and decrease the incidence of laryngospasm.

Conclusion: the use of topical lidocaine as anesthetic adjuncts for patients during gastrointestinal endoscopic procedures decreased the level of post-procedural pain and the risks of gag events and involuntary movement without affecting the hemodynamic and respiratory profiles. Furthermore, lidocaine could increase endoscopist satisfaction, and shorten recovery time without compromising the ease of procedure for endoscopists .

Key words: gastrointestinal ,endoscopy, topical anesthesia

INTRODUCTION

Endoscopy plays a significant role in the diagnosis and treatment of gastrointestinal diseases. Sedation has been used in clinical practice to make the procedure more comfortable, and improve patient satisfaction. Although sedation is widely used for these benefits, it continues to pose some potential risks, requiring medical teams to closely monitor the patients during the procedure[(1)]. Local anesthetic agents during UGIE are widely used as a single method or in combination with intravenous anesthetic agents [(2)]. There is compelling evidence for the use of topical pharyngeal anesthesia during UGIE, and it is reported to improve ease of the procedure, as well as patient tolerance[(3)].

Upper Gastrointestinal endoscopy

Upper gastrointestinal endoscopy (UGIE) is a procedure for diagnosis and treatment of gastrointestinal tract disorders. This procedure requires some forms of anesthesia. The goal of procedural anesthesia is to provide safety, effective control of pain and anxiety, as well as an appropriate degree of memory loss or reduced awareness. Generally, the majority of UGIE procedures are performed by using topical anesthesia and intravenous sedation. General anesthesia is

carried out in long and invasive procedures such as endoscopic retrograde cholangiopancreatography. The appropriate anaesthetic agents for UGIE procedures should be short acting, rapid onset with little adverse effects and also improved safety profiles [4].

Topical pharyngeal anesthesia of upper gastrointestinal endoscopy :

Topical pharyngeal anesthesia (TPA) and/or conscious sedation are used in patients before the endoscopy [1]. Conscious sedation increases the patient's tolerance and acceptance of the procedure [5] however, it has several disadvantages, such as prolonged duration of the procedure, increased cost, and increased complication risk [6].

Advantages of topical pharyngeal anesthesia

Topical pharyngeal anesthesia is preferred in many centres, particularly for diagnostic endoscopy[7], It enhance patient tolerance and eases endoscopy in the absence of conscious sedation [8]. Besides enhancing patient comfort, TPA creates a convenient work environment for the endoscopist [9].

Many studies have compared topical anesthetic agents to other formulations and techniques such as viscous, lozenge, lollipop, and nebulized lidocaine administration. However, it is still unclear which technique is optimal in terms of its influence on the gag reflex, patient tolerability, and pain [10].

Topical pharyngeal anesthesia currently is a requirement for upper endoscopy to provide patients with the best comfort in unsedated esophagogastroduodenoscopy (EGD). In Hong Kong, 10% Xylocaine pump spray (AstraZeneca, Sodertalje, Sweden) is the pharyngeal anesthesia generally used as a premedication in unsedated EGD [11]**.** There is compelling evidence for the use of topical pharyngeal anesthesia during UGIE, and it is reported to improve ease of the procedure, as well as patient tolerance so it is beneficial in UGIE [3, 7]**.**

Lidocaine is used for pharyngeal anesthesia to decrease cough, gag reflex and overall airway hyper‑reactivity, enhancing patient compliance and practitioner satisfaction [12]**.**

Supe et al., [12]who stated the benefit from using topical anesthesia to diminish gag reflex reported that lidocaine lozenges are an easier way of applying local oropharyngeal anesthesia, produces better suppression of gag reflex and makes the procedure easier when compared to lidocaine spray.

Hung et al., [13] reported that topical lidocaine during UGIE could decrease the level of post endoscopy pain, risk of gag events , and involuntary movement without significant impacts on hemodynamic and respiratory profiles. And that only i.v. lidocaine was able to, increase endoscopist satisfaction, and shorten recovery time without adversely affecting the smoothness of endoscopy for the endoscopists (i.e. procedure time).

Disadvantages of topical pharyngeal anesthesia

Topical anesthesia maybe need some sort of anxiolysis and so **Froehlich et al**

(14) reported that the patient acceptance of upper gastrointestinal endoscopy is assumed to be directly related to the degree of amnesia induced by the sedation and low dose of midazolam maybe beneficial .

Unfortunately pre-procedural anxiety levels in women, younger subjects, slender subjects, and those without previous experience of conscious sedation , should be observed with great caution because they generally complain of more pain and alertness during the procedure**(15)**.

Common drug used for topical pharyngeal anesthesia

One of the most common local anesthesia used before upper gastrointestinal endoscopy is lidocaine, It is provided in two forms: spray and viscous solution. These two forms have different characteristics: the spray is simple and easy to use but may stimulate the gag reflex. On the other hand, the viscous solution has a bitter taste, irritates the throat during swallowing, and the patient stores the solution in their pharynx for few minutes **(16)**.

Watanabe et al **(16)** compared between lidocaine spray versus viscous lidocaine solution for pharyngeal local anesthesia in upper gastrointestinal endoscopy and found out that the use of lidocaine spray for local anesthesia provided better satisfaction scores than the viscous solution, and both methods have the same effect with regards to the control of discomfort and pain. lidocaine used as single-agent anesthesia in upper gastrointestinal endoscopy as in lidocaine lollipop which is found to be a promising form of local oropharyngeal anesthesia for EGD. As its use resulted in sparing the use of intravenous sedation. It is well tolerated and safe and may be particularly important in the elderly, patients with comorbidities, and office-based endoscopy.

Lidocaine :

Chemical structure:

Lidocaine is an amino-amide-type local anesthetic lidocaine is 60-80% protein bound, mostly to a-1-acidic glycoprotein. Lidocaine crosses the blood brain barrier through passive diffusion across membranes. It may exist in ionized or unionized forms; given its pK a value of 7.9, 25% of lidocaine is present in the unionized form at a physiological pH of 7.4 (Figure1) **(17)**.

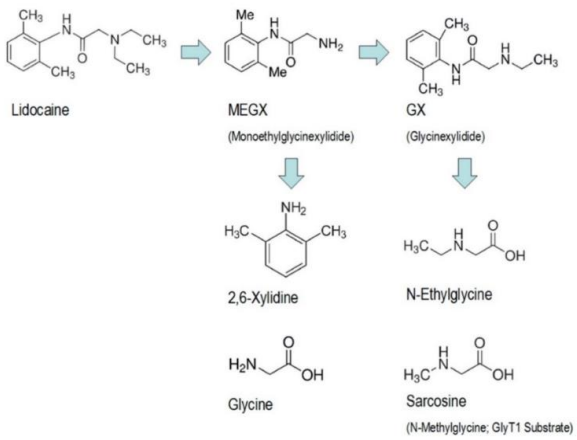

Figure1. Chemical structure of lidocaine and its metabolites **(17)** **.**

Mechanism of Action:

The principal mechanism of action of lidocaine as a local anesthetic is through blockade of voltage-gated sodium channels (VGSCs) leading to a reversible block of action potential propagation. Like with all local anesthetics , only the un-ionized form

of the drug (i.e. the free base form) is able to permeate the lipophilic cell membranes. Intracellularly, the ionized form blocks sodium channels by binding to Segment 6 of Domain 4 of the a subunit of the ion channel [(18)].

Pharmacokinetic:

Lidocaine is a weak base and poorly hydro-soluble. lidocaine is initially distributed to highly vascularized organs (i.e. brain, kidneys, and heart), and then to less vascularized tissue (i.e. skin, skeletal muscle, and adipose tissue). The volume of distribution is around 91 L.kg-1. Up to 60 to 80 % of lidocaine is bound to plasma protein (albumin, mostly with α- 1 acid glycoprotein which increases postoperatively and in elderly patients, and lipoprotein) [(19)].

Pharmacodynamics:

Excessive blood levels of lidocaine can cause changes in cardiac output, total peripheral resistance, and mean arterial pressure. With central neural blockade these changes may be attributable to the block of autonomic fibres, a direct depressant effect of the local anesthetic agent on various components of the cardiovascular system, and/or the beta-adrenergic receptor stimulating action of epinephrine when present. The net effect is normally a modest hypotension when the recommended dosages are not exceeded[(20)].

lidocaine can potentially block or otherwise slow the rise of cardiac action potentials and their associated cardiac myocyte contractions, resulting in possible effects like hypotension, bradycardia, myocardial depression, cardiac arrhythmias, and perhaps cardiac arrest or circulatory collapse [(21)].

Conclusion: the use of topical lidocaine as anesthetic adjuncts for patients during upper gastrointestinal endoscopic procedures decreases the level of post-procedural pain , the risks of gag events and involuntary movement without affecting the hemodynamic and respiratory profiles. Furthermore, lidocaine could increase endoscopist satisfaction, and shorten recovery time without compromising the ease of procedure for endoscopists .

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