

Sedation Techniques for Ophthalmic Surgery

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Objectives

- Discuss goals for ideal patient sedation techniques
- Compare use of single medication sedation vs multi-drug sedation techniques
- Review newer medication options used for sedation
- Identify non-IV options for sedation

History of ophthalmic surgery



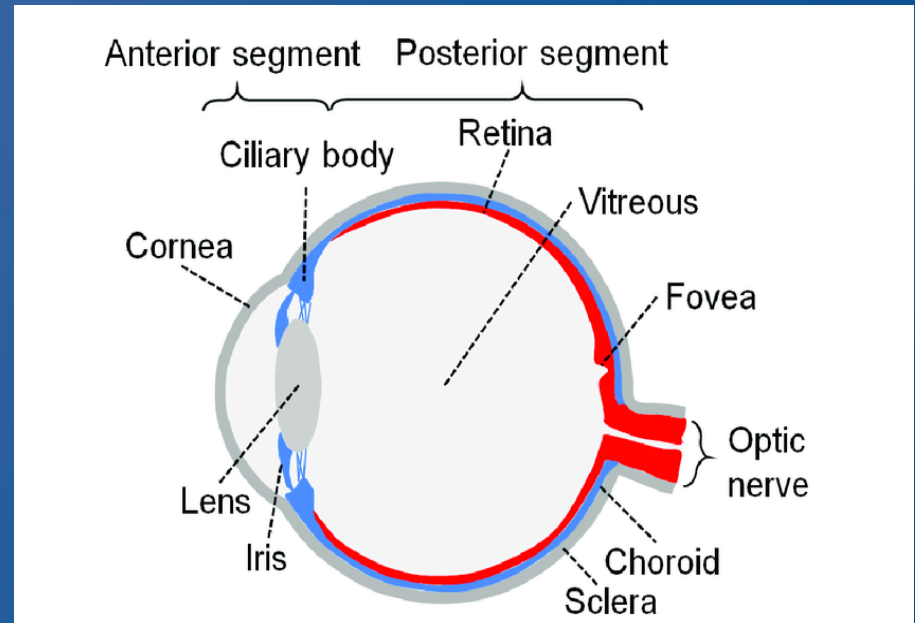
We've come a long way...



IN VIEW:
Users of the system can move their head to change the focus of the camera, and control image enhancement and lighting. (Image courtesy of Beyonics)

Common Ophthalmic Surgeries

- Cataract surgery
- Corneal surgery
- Refractive surgery
- Glaucoma surgery
- Oculoplastic surgery
- Extraocular muscle surgery
- Vitreoretinal surgery
- Open globe injury surgery
- Ophthalmic oncology surgery



Goals for patient sedation

- Patient:
 - anxious about medical procedure
 - worried about surgical outcome
 - worried about ability to “lie completely still”
 - concerned they might move/sneeze
 - experience pain during surgery
 - claustrophobia
- Anesthesiology provider:
 - Provide anxiolysis
 - Minimize pain
 - Maintain patient cooperation, respiratory function, cardiovascular stability, and airway patency



Ideal scenario



Realistic scenario



Levels of sedation

Monitored Anesthesia Care

MAC



GRAY ZONE



GENERAL ANESTHESIA

Conscious Sedation

- + own airway
- + gag reflex
- + responds to verbal
- + responds to pain

Deep Sedation

- Loss of ability to maintain own airway
- Partial/complete loss of gag reflex
- Not easily aroused
- Unable to respond purposefully to verbal requests
- Unable to respond purposefully to physical stimulation

General Anesthesia

- Complete loss of protective reflexes
- Loss of ability to maintain airway
- Is unable to respond to verbal requests
- Is unable to respond to physical stimulation

Analgesia during ophthalmic surgery

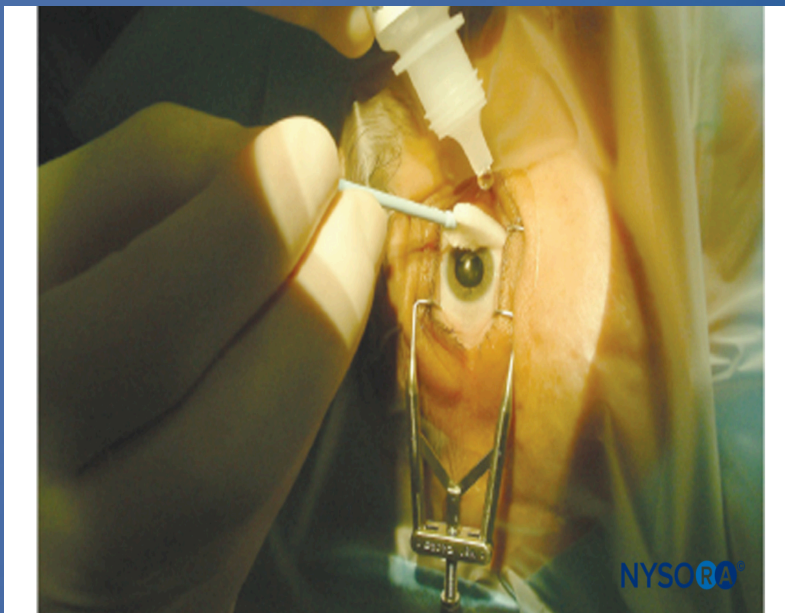
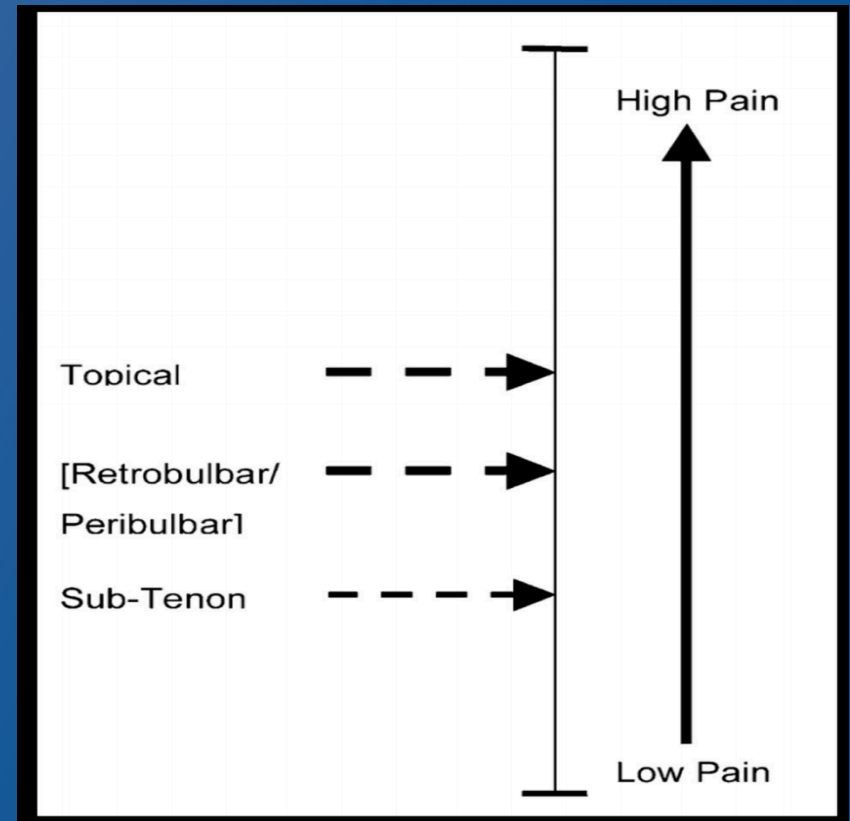
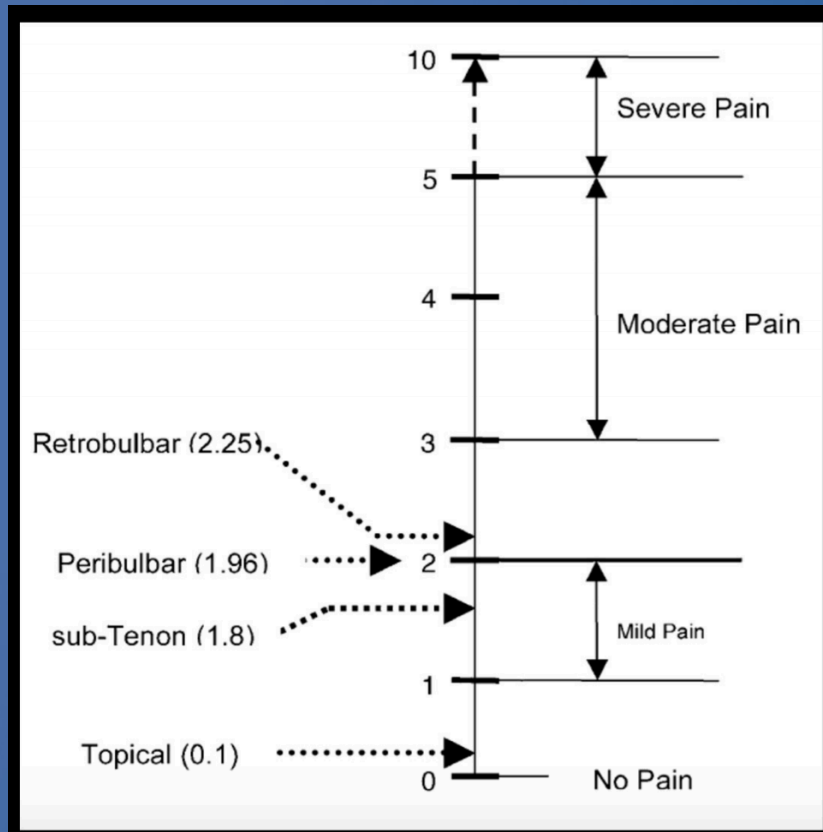


FIGURE 12. Topical anesthesia.



Perceived pain during analgesia administration and during surgery



Malik A, Fletcher EC, Chong V, Dasan J. Local anesthesia for cataract surgery. J Cataract Refract Surg. 2010 Jan;36(1):133-52.

Can ophthalmic surgery be accomplished without sedation?

YES!

- Patient education
- Surgeon encouragement and input
- Realistic expectations
- Verbal reassurance
- Team discussion
- Benefits outweigh risks
- Plan B for sedation



Benefits of sedation for ophthalmic surgery during COVID pandemic

- Avoid manipulation of the airway and potential aerosolization
- Sneeze reflex during propofol boluses and direct bright light to the eyes
- More versatile = less affected by drug and equipment shortages

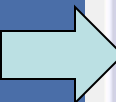
Propofol

- Effective sedative, with topical and/or regional analgesia
- Titrate for sedation
- Bolus for a block
- Continuous infusion
- Conversion to general anesthesia
- Antiemetic



Many clinical uses of propofol

BOX 30-1 *Uses and Doses of Intravenous Propofol*



Induction of general anesthesia	1-2.5 mg/kg IV, dose reduced with increasing age
Maintenance of general anesthesia	50-150 µg/kg/min IV combined with N ₂ O or an opiate
Sedation	25-75 µg/kg/min IV
Antiemetic action	10-20 mg IV, can repeat every 5-10 min or start infusion of 10 µg/kg/min

From Reves JG, Glass P, Lubarsky DA, et al: *Intravenous anesthetics*. In Miller RD, Eriksson LI, Fleischer LA, et al, editors: *Miller's anesthesia*, ed 7. Philadelphia, 2010, Churchill Livingstone, pp 719-768.

IV, Intravenously; N₂O, nitrous oxide.

Multi-drug sedation technique:

Midazolam/Fentanyl/Ketamine/Propofol

- **Midazolam**- give 1-2mg IV upon arrival in OR, may use additional doses to supplement during procedure
- **Fentanyl**- give 25mcg IV upon arrival in OR, may use additional doses during procedure as required
- **Ketamine**- give 25mg IV when ophthalmologist enters into room
- **Propofol**- give 20-50mg IV immediately prior to needle block

Harnessing the benefits of each drug

- **Midazolam**- anxiolytic and amnesia
 - ❖ Onset time is slower than propofol, give on transport to the OR. Wait 2-3 minutes to evaluate sedative effect.
 - ❖ Minimal effects on respirations and cardiovascular system at low doses.
 - ❖ Flumazenil is reversal agent.
- **Fentanyl**- analgesia and mild sedative
 - ❖ 25mcg dose helps prevent eye squeezing during block with minimal respiratory effects.
 - ❖ May use during case to supplement suboptimal block or for back discomfort in prolonged supine position.
 - ❖ Naloxone is reversal agent.

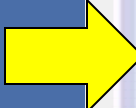
Harnessing the benefits of each medication

Ketamine- sedation and analgesia

- Onset 30-60 secs
- Acts on multiple receptors including NMDA and opioid receptors
- Small doses (0.2-0.5mg/kg) not associated with significant adverse psychological effects without nystagmus.
- Dissociative cognitive state
- Minimal effects on respiratory drive, optimal for patients with OSA
- Useful in chronic pain patients.
- Consider administration with midazolam and Propofol.
- Increased salivation

Ketamine: hypnotic and analgesic

BOX 30-3 *Uses and Doses of Ketamine*



Induction of general anesthesia*	0.5-2 mg/kg IV 4-6 mg/kg IM
Maintenance of general anesthesia	0.5-1 mg/kg IV with N ₂ O 50% in O ₂ 15-45 µg/kg/min IV with N ₂ O 50-70% in O ₂ 30-90 µg/kg/min IV without N ₂ O
Sedation and analgesia	0.2-0.8 mg/kg IV over 2-3 min 2-4 mg/kg IM
Preemptive or preventive analgesia	0.15-0.25 mg/kg IV

From Reves JG, Glass P, Lubarsky DA, et al: Intravenous anesthetics. In Miller RD, Eriksson LI, Fleischer LA, et al, editors: Miller's anesthesia, ed 7. Philadelphia, 2010, Churchill Livingstone, pp 719-768.

IM, Intramuscularly; IV, intravenously; N₂O, nitrous oxide.

*Lower doses are used if adjuvant drugs such as midazolam or thiopental also are given.

A novel mixture of propofol, alfentanil, and lidocaine for regional block with monitored anesthesia care in ophthalmic surgery

Zhuang T. Fang MD, MSPH (Assistant Professor of Clinical Anesthesiology) 吳 瑗, Mary A. Keyes MD (Professor of Clinical Anesthesiology)

- 6 mL of propofol
- 2 mL of alfentanil
- 2 mL of 2% lidocaine (6-2-2 mixture)
- The bolus dose was determined based on the patients' age:
 - ❖ 5 $\mu\text{g/kg}$ of alfentanil (and 0.3 mg/kg of propofol) for patients older than 75 years
 - ❖ Increase alfentanil dose 1 $\mu\text{g/kg}$ per 10-year decrease in age
 - ❖ Maximum of 9 $\mu\text{g/kg}$ of alfentanil (0.54 mg/kg of propofol) for patients younger than 45 years.
- Regional block was reliably performed at 1 minute after bolus completion without cardiovascular compromise and consistent patient satisfaction.

Short acting, potent opioids

Medication	Onset (min)	Peak effect (min)	Duration (min)	Potency (compared to morphine)
Sufentanil	2	5	30-60	1,000x
Remifentanil	1.5	1.5	9-18	100x
Alfentanil	1-2	1-2	30	10x
Meperidine	1-2	5-7	120-240	0.1x

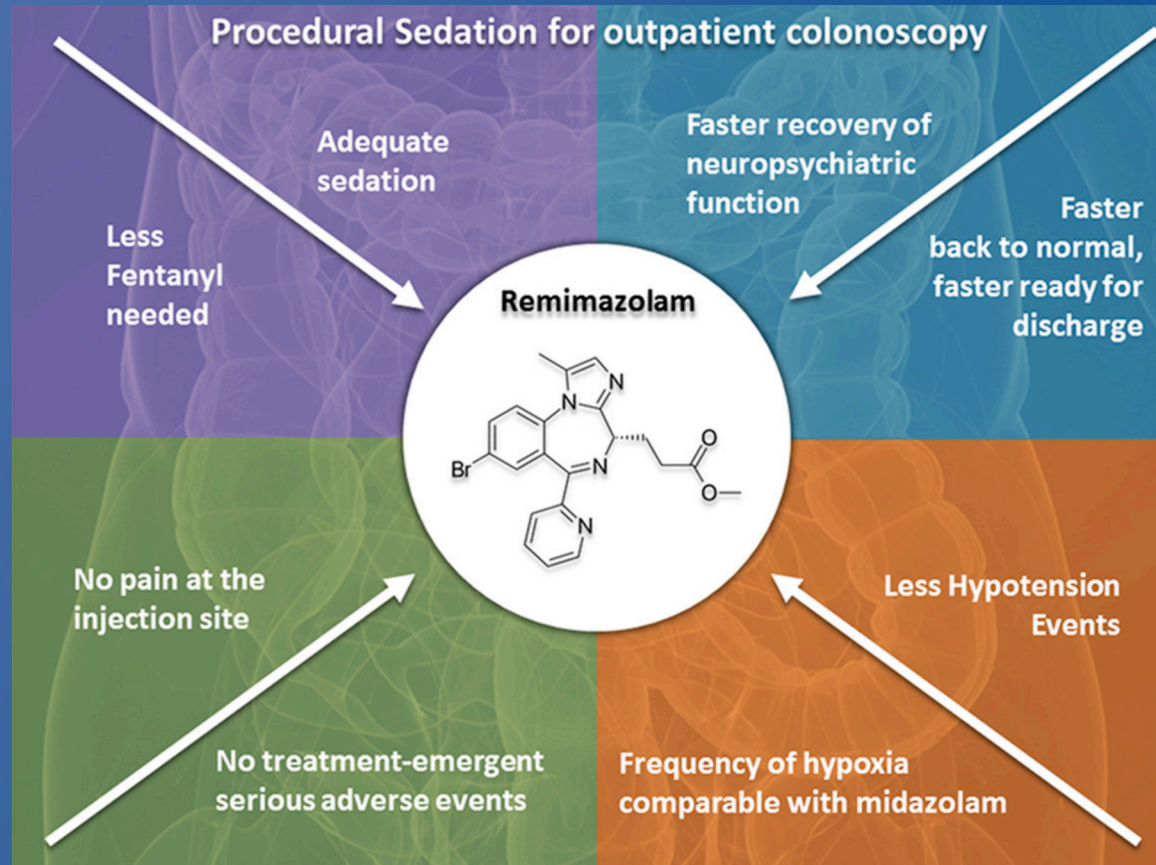
Remifentanyl

- Low dose bolus 25-50 mcg prior to ophthalmic block.
- Brief apnea. Pre-oxygenate prior to IV bolus.
- Verbal or tactile stimulation to resume ventilation.
- Bradycardia
- Chest wall rigidity



Remimazolam – recently FDA approved

Remifentanyl and midazolam

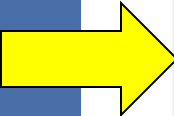


Remimazolam

- Recommended dosing guidelines:

Induction of Procedural Sedation	For adult patients: Administer 5 mg intravenously over a 1-minute time period.
	For ASA-PS (American Society of Anesthesiologists Physical Status) III and IV patients: Administer 2.5 mg to 5 mg intravenously over 1 minute based on the general condition of the patient.
Maintenance of Procedural Sedation (as needed)	For adult patients: Administer 2.5 mg intravenously over 15 seconds. At least 2 minutes must elapse prior to administration of any supplemental dose.
	For ASA-PS III and IV patients: Administer 1.25 mg to 2.5 mg intravenously over 15 seconds. At least 2 minutes must elapse prior to administration of any supplemental dose.

Dexmedetomidine (precedex): alpha 2-adrenergic agonist



	Loading Dose	Maintenance Dose
Adult patients and procedures	1 mcg/kg over 10 minutes*	Followed by 0.6 mcg/kg/hr
Less invasive procedures (e.g., ophthalmic)	0.5 mcg/kg over 10 minutes may be suitable	- Titrate to effect with doses from 0.2–1 mcg/kg/hr - Rate of infusion should be adjusted to achieve targeted level of sedation
Patients over 65 yrs	0.5 mcg/kg over 10 minutes	A reduction in maintenance dosage should be considered
Patients with impaired hepatic or renal function	A dose reduction should be considered	A reduction in maintenance dosage should be considered
Awake fiberoptic intubation	1 mcg/kg over 10 minutes	Followed by 0.7 mcg/kg/hr until endotracheal tube is secured

*Coadministration of Precedex with anesthetics, sedatives, hypnotics and opioids can enhance the pharmacodynamic effects of these agents. Specific studies have confirmed these effects with sevoflurane, isoflurane, propofol, alfentanil and midazolam. A decrease in the dosage of Precedex or the concomitant agent may be required. In patients already sedated with other anesthetics, sedatives, hypnotics or opioid analgesics, a loading dose may not be necessary.

Dexmedetomidine (precedex)

Incidence and Interventions for Hypotension, Bradycardia in Patients Undergoing Procedural Sedation³

	Hypotension* (n=318)	Bradycardia† (n=318)
Overall Incidence	173 (54%)	45 (14%)
Intervention	(n=173)	(n=45)
No Intervention Required	113 (65%)	33 (73%)
Intervention Required	60 (35%)	12 (27%)
Type of Intervention When Required†	(n=173)	(n=45)
→ Ephedrine or Phenylephrine	55 (32%)	1 (2%)
Glycopyrrolate	-	7 (16%)
Atropine	-	1 (2%)
Calcium Chloride	2 (1%)	-
Dopamine	1 (<1%)	-
IV Fluid Administration	16 (9%)	-
Precedex Dose Reduced	9 (5%)	-
Precedex Discontinued	1 (<1%)	1 (2%)

Pharmacology of non-opioid analgesics

Non-opioids are used in multimodal analgesia to reduce risks associated with opioids and enhance analgesic effects.

Medication	Onset (min)	Peak effect (min)	Duration (min)	Notes
Dexmedetomidine	5-10	25	240	Easily titrated
I.V. acetaminophen	15	30	240-360	- Used at end of surgery - Contraindicated in patients with liver disease
Ketorolac	30	45-60	240-360	- Used at end of surgery - Caution in patients with bleeding issues
Ketamine	0.5-1	5	30-60	- May cause postoperative delirium - Adjunct for patients with chronic pain - Bronchodilator

Sedation without an IV? Yes!

The IV can be a source of anxiety

- Verbal and tactile reassurance
- Oral benzodiazepines – caution if patient is naïve, possible paradoxical effect
- Oral diphenhydramine – allergy season, post nasal drip
- Intranasal: fentanyl, midazolam, dexmedetomidine – pediatric population, use highest concentration/lowest volume dose
- IM: ketamine, midazolam, glycopyrrolate – pediatric and non cooperative population
- MKO melt

Oral vs IV midazolam



Published in Ophthalmology, Aug 2019: Crandall E. Peeler, M.D., from Boston Medical Center, and colleagues randomly assigned 85 patients (mean age, 65.8 years) scheduled for cataract surgery to receive either oral triazolam with IV placebo or IV midazolam with oral placebo preoperatively.

Surgeons and anesthesia providers reported similar satisfaction in the two groups.

The use of oral sedation in cataract surgery has been suggested as a cost- and space-saving measure, potentially allowing the transition of some cases from an operating to procedure room or office-based setting.

MKO melt

- Offers an opioid-sparing alternative to conscious sedation that is safe & effective in the reduction of anxiety and need for additional IV medications when used for cataract surgery in appropriately selected patients.



MKO:

midazolam- ketamine-ondansetron

- Sublingual troche contains : 3mg Midazolam, 25mg Ketamine, 2mg ondansetron
- Doses range from 1-2 troche depending on health status, age & anxiety level- the average patient gets 2. Dissolves in about 3 - 5 minutes.
- Effects seen in 10-15 minutes, duration of effects about 100 minutes
- Dose recommendations are for patients in good health (ASA 1 and 2)
- Patients who regularly use alcohol, illicit drugs, benzodiazepines, or are extremely nervous may require higher dosing;
- Patients who have several co-morbidities, are very frail, at the extremes of age or are motivated and cooperative may require lower dosing.

MKO melt

- Difficult IVs = delays = decreased efficiency = \$\$\$\$.
- Ketamine + midazolam = analgesic + sedative
- Patients are anxious about getting the IV and many complaints are related to the IV. When given a choice, patients often choose oral sedation over IV sedation.
- Sublingual route bypasses the need for swallowing and gastric absorption. Bypasses the hepatic first pass effect with the result being increased bioavailability.

Summary

- Anxiolytics, analgesia, and immobile/cooperative eye
- Single medication sedation technique are effective.
When using multi-drug sedation techniques, be aware of synergetic effects, both beneficial and adverse.
- Medications combinations have uses in various clinical settings, including procedural sedation.
- Non-IV administered medication can provide comparable anxiolytic and analgesic effects.

Thank you

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