
Facial Laser Resurfacing with the Propofol-Ketamine Technique: Room Air, Spontaneous Ventilation (RASV) Anesthesia

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BACKGROUND. Multiple anesthetic approaches exist for full-face laser resurfacing. The propofol-ketamine technique is reviewed as a reasonable alternative to providing adequate anesthesia for full-face laser resurfacing in the office environment.

OBJECTIVE. To report outcomes using propofol-ketamine opioid avoidance, room air, spontaneous ventilation monitored anesthesia care (MAC).

METHOD. A retrospective chart review of 95 consenting adult patients receiving propofol-ketamine anesthesia in a private practice, office-based setting.

RESULTS. An average of 6 (200 mg) ampules of propofol, including waste, were used per patient. All patients received adequate anesthesia as evidenced by a lack of movement during surgery. There were no hallucinations, no postoperative nausea or vomiting (PONV), no cardiovascular instability or seizures (clinical signs of lidocaine toxicity), and no hospital admissions for either PONV or pain.

CONCLUSION. The propofol-ketamine technique appears to be an excellent alternative anesthetic approach to EMLA cream, tranquilizer-opioid regimens, or general inhalational anesthesia for facial laser resurfacing.

FACIAL RESURFACING with lasers has become a very popular, office-based procedure. Anesthesia techniques for this procedure vary from EMLA cream to intravenous sedation with tranquilizer-opioid (i.e., midazolam-fentanyl) regimens to general inhalational anesthesia. EMLA cream may be inadequate to prevent patient movement for good field conditions. The use of opioids mandates the use of oxygen, a fire hazard in the presence of lasers, to maintain the pulse oximetry at greater than 90%. Opioid use is also associated with at best an 8.3% incidence of postoperative nausea and vomiting (PONV) when used with a combination of droperidol and ondansetron prophylaxis.¹ Orkin² demonstrated that PONV, not pain, was the patient's primary concern about anesthesia. General anesthesia using halogenated inhalational anesthetics exposes the patient to the risk of malignant hyperthermia (MH). It may be difficult to justify any risk of MH to patients having surgery with no medical indication, such as elective cosmetic surgery.

The propofol-ketamine technique³ is an opioid avoidance, room air, spontaneous ventilation dissociative monitored anesthesia (MAC) technique derived from the diazepam-ketamine technique of Vinnik.⁴ The propofol-ketamine technique simulates the conditions of general anesthesia (i.e., a relaxed surgical field in a

quiet, immobile patient) without the risk of MH (neither propofol nor ketamine are triggering agents) or the increased equipment requirements [i.e., anesthesia machine, scavenging, endotracheal tubes, laryngeal mask airways (LMAs), and dantrolene]. A near zero (0.6% or 7 of 1264 patients) PONV incidence has recently been reported with the propofol-ketamine technique.⁵

Methods

All patients were interviewed preoperatively by the author to review their medical histories including medications taken, allergies to medications, smoking history, and problems with previous anesthesia experiences (i.e., PONV or hangover). Patients with previous PONV were not excluded from this review. The monitors (EKG, noninvasive blood pressure, and pulse oximetry) were explained as well as the drugs to be given. Particular attention was given to the expected dry mouth from the glycopyrrolate as well as the history and hallucinogenic potential of ketamine. The bispectral index (BIS) monitor became available to the author in December 1997 and was used only sparingly in this patient population. All operating rooms had oxygen, Ambu bags, suction, crash carts, and defibrillators available and in good working condition prior to inducing anesthesia.

After securing an intravenous line, baseline vital signs were determined before any medications were administered. Glycopyrrolate 0.2 mg was given intravenously to all patients at the outset. In an attempt to reduce propofol requirements, a small number of patients received either 2 or 4 mg midazolam prior to induction. Propofol was adminis-

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tered as a dilute (5 mg/ml) solution in a 50 ml bag connected via a 60 drops/ml intravenous set piggybacked into the most proximal main intravenous port to the patient. The dead space was approximately 1 ml. The patients were slowly (2–10 minutes) titrated to a loss of lid reflex and a loss of verbal response. At this time a 50 mg intravenous bolus of ketamine was administered and the surgeon notified that within 2 minutes the injection of local anesthetic could commence. If the patient made purposeful movement with injection, the injection was terminated until additional ketamine could be administered.

The main branches of the trigeminal nerve (the supraorbital, supratrochlear, infraorbital, and mental) were blocked with 2–5 ml of 2% lidocaine with 1:100,000 epinephrine. In addition, the zygomaticotemporal and zygomaticofacial branches also received 1 ml of the same solution. A field block of 1% lidocaine with 1:100,000 epinephrine was injected along the entire perimeter of the face. Often a fan injection in the cheek area was performed with the same 1% solution.

Patients' ages, genders, weights, total propofol and ketamine doses, as well as anesthesia times, were tabulated by the author. All anesthetics were administered by the author. The anesthesia records of the patients receiving propofol-ketamine anesthesia were reviewed for this study.

Results

A total of 95 consenting, ASA 1 or 2, adult female and male patients were reviewed in this retrospective chart review. The patients came from the 12 different surgeons' practices during the period December 19, 1995–January 15, 1999. There were 82 females and 13 males in the group. On average the females were 49 years old, weighed 61 kg, consumed 1003 mg of propofol for 88 minute cases. The males, on average, were 39 years old, weighed 78 kg, consumed 1115 mg of propofol for 87 minute cases. Females consumed an average 11.4 mg/min and 188 μ g/kg/min of propofol while males consumed an average 13.0 mg/min and 168 μ g/kg/min of propofol. The results are further

Table 1. Female Patients (*N* = 82^a)

	0 midazolam	2 mg midazolam	4 mg midazolam
<i>N</i>	60	15	6
Age (years)	51	44	44
Weight (kg)	61.3	60.6	64.6
Propofol (mg)	974	1055	1260
Amps (200 mg)	5	6	7
Ketamine (mg)	73	86	68
Time (minutes)	84	100	101
mg/min	11.6	10.3	13.7
ug/kg/min	190	175	213

^aOne patient received 1 mg midazolam.

Table 2. Male Patients (*N* = 13^a)

	0 midazolam	2 mg midazolam	4 mg midazolam
<i>N</i>	7	2	3
Age (years)	37	38	46
Weight (kg)	76	78	74
Propofol (mg)	1070.0	795	1307
Amps (200 mg)	6	4	7
Ketamine (mg)	114	50	133
Time (minutes)	79	80	105
mg/min	13.2	12.5	12.3
ug/kg/min	177	153	164

^aOne patient received 6 mg midazolam.

displayed by premedication category in Tables 1 and 2. No patient received more than a total of 200 mg ketamine.

For the most part, patients remained motionless during the surgery. Some extremity movement occurred that did not disturb the surgical field. Patients were asked upon emergence and discharge whether they experienced hallucinations or recall. No patient responded in the affirmative. There was no PONV in this patient group. No severe hypotension, atrio-ventricular dissociation, seizures, or cardiac arrests were experienced intraoperatively. No patient complained of tinnitus or metal taste on the tongue on emergence from anesthesia. No patient stayed longer than 60 minutes before discharge to home. No patients were admitted to the hospital for either PONV or intractable pain. All patients reported satisfaction with the anesthetic and stated they would be willing to have it again.

Discussion

Blakely et al.⁶ recently cited their experience with 20 patients using a variation of propofol-ketamine as providing inadequate analgesia for full-face laser resurfacing. The likely source of the inadequate analgesia was the 0.5% lidocaine with 1:400,000 epinephrine (compared to 2% with 1:100,000 in this series) employed for facial nerve block. Further evidence of the inadequate analgesia was that more than 70% of their patients required postoperative analgesia prior to discharge. They reported an average home readiness time of about 90 minutes and an actual average discharge time of more than 130 minutes. They also reported a 35% incidence of PONV. No prophylactic antiemetics were used despite the use of fentanyl. These patients were allowed to experience SpO₂ as low as 85% on room air.

Avoiding routine opioid use, all patients in this series were able to maintain an SpO₂ of greater than 90% on room air. All 95 patients had adequate local

anesthesia, as evidenced by the minimal movement during surgery. Only 12% required postoperative analgesia prior to discharge. Discharge times were uniformly less than 60 minutes. No prophylactic antiemetics were used. There was no PONV in this series, suggesting that opioid avoidance was constructive.

The lack of severe hypotension, atrio-ventricular dissociation, seizures, or cardiac arrests intraoperatively or patient complaints of tinnitus or metallic taste on emergence suggests an absence of lidocaine toxicity despite the fact that more than 7 mg/kg lidocaine with epinephrine⁷ were routinely used. Rarely was more than a total of 1000 mg of lidocaine used. Although Klein⁸ established that 35 mg/kg was a safe dose for tumescent liposuction, there are no data available to define a safe dose of lidocaine with epinephrine for facial block. Experience with this group suggests that 15–20 mg/kg lidocaine with epinephrine is well tolerated in healthy patients.

The average patient consumed six (200 mg) ampules of propofol for an average 1.5 hours of anesthesia time. The 1999 National Specialty Services' price for proprietary propofol is \$13.00 per ampule. This translates into a drug cost of \$78.00 as the main cost of the propofol-ketamine technique. Glycopyrrolate and ketamine are both available as generic formulations. Those costs are negligible compared with the propofol. The effect of midazolam premedication did not substantially reduce propofol consumption in this uncontrolled retrospective review. When Oxorn et al.⁹ subjected midazolam premedication effect on propofol consumption to a prospective, double-blind, randomized, controlled study, there was no significant reduction in the amount of propofol required for either induction or maintenance of anesthesia. A recent study¹⁰ showed no effect on the BIS-monitored level of propofol sedation by the addition of a dissociative dose of ketamine. The differences in average ketamine doses were the result of some patients requiring more than one 50 mg dose to remain immobile for the local anesthetic injection. When patients were monitored with the BIS, the cheeks and lower face were treated initially. The monitoring strip was then removed from the forehead to finish the procedure. Although only two patients in this series had BIS monitoring, earlier published work¹¹ suggests an average savings of 416

mg of propofol (two 200 mg ampules) per case when it is used compared to not using it.

Conclusion

The outcomes of 95 patients in this retrospective review receiving propofol-ketamine anesthesia for facial laser resurfacing were very satisfactory and demonstrated similar field conditions to general inhalational anesthesia without the risk of MH or increased equipment requirements. Patients experienced essentially zero anesthesia morbidity from propofol-ketamine as defined by zero PONV, hallucinations, recall, clinical signs of lidocaine toxicity, prolonged discharge time, or hospital admission for PONV or pain. The propofol-ketamine technique appears to be an excellent alternative anesthetic approach to EMLA cream, tranquilizer-opioid regimens, or general inhalational anesthesia for facial laser resurfacing.

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Commentary

Thank you for the opportunity to review Dr. Friedberg's article. He has certainly demonstrated that the technique he describes has worked well for his patient series.

I believe he was very fortunate not to have any severe side effects from the ketamine. The combination of propofol and midazolam probably strongly decreases the chance of dysphoria

and postoperative nightmares that have been seen with the use of ketamine in the past. Hopefully he will continue to avoid these adverse reactions as the number of patients increases beyond the 95 included in this article.

On a philosophical note, I am not sure that this technique could really be called MAC (monitored anesthesia care). The dose of ketamine is more than 1 mg/kg in the study patients, in addition to propofol and sometimes midazolam. The induction dose for general anesthesia is 1–2 mg/kg IVP when ketamine is used alone, and 0.2 mg/kg has been described in the Clinical Anesthesia Procedures of the MGH handbook as adequate for sedation. I am not saying that the technique is not safe, but it is just a general anesthetic without an artificial airway, for some part of the procedure.

I agree fully with the author's goal of avoiding narcotics.

This can be accomplished with nonsteroidal anti-inflammatories, acetaminophen, and long-acting local anesthesia. Instead of using ketamine, more midazolam and additional propofol can be used. Furthermore, intravenous lidocaine can be mixed with the propofol to decrease the cost and increase the effectiveness of the propofol.

Having spoken to patients severely traumatized by ketamine experiences, I am still hesitant to use the medication on an elective basis when other medications without the associated psychoactive adverse effects are readily available.

Thank you again for allowing me to review this very interesting article.

THOMAS EINSTEIN, MD
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Response

Thank you for the opportunity to respond to the commentary by Thomas Einstein, MD. We are given no information about who this individual is, if he has any experience in administering anesthesia in the office-based environment or if he has any pertinent references to support his opinion. His familiarity with the bispectral index (BIS) monitor is also unknown.

The principles of avoiding severe side effects from ketamine were established by Dr. Charles A. Vinnik, a Las Vegas, Nevada plastic surgeon, over twenty years ago (see article reference 4). I gave my first propofol-ketamine anesthetic on March 26, 1992 and continue to this day. My database contains over 1,800 safe, happy, non-traumatized patients. There is nothing 'fortunate' about my patients not experiencing ketamine-induced hallucinations. As far as the gratuitous comment about 'hoping I will continue to avoid adverse reactions as the number of patients increases beyond the 95 included in the article,' Dr. Einstein might have realized by reading this article that my earlier publication (see article reference 5) of the propofol-ketamine technique had 1,264 patients (there were also no hallucinations in this significantly larger series, a fact I neglected to mention but was contained in the article referenced). I also apologize for omitting the reference: Friedberg BL. Hypnotic doses of propofol block ketamine induced hallucinations. *Plast Reconstr Surg* 1993;91:196–7 which might have clarified the issue.

As to the issue propofol-ketamine being a general anesthetic based on the 1–2 mg/kg dose of ketamine described in the non-published, non-peer reviewed resident's 'cookbook' manual,

my article clearly states a 50 mg dose of ketamine to 61-kg women and 78-kg men (in 'Results'). In either case, the dose is less than 1 mg/kg. The doses of ketamine reported in the tables are the aggregate doses not the initial bolus. Reference 11 shows no change in the level of BIS-monitored hypnosis by the addition of dissociative dose (50 mg) of ketamine. A decrease in the BIS during the dissociative state would likely have been due to an increasing level of hypnosis. The lack of a downward change in BIS may support the assertion that a dissociative dose of ketamine, when added to a stable level of propofol hypnosis, acts only as a transitory (10–20 minutes, Vinnik CA, verbal communication, March, 1992) analgetic. Hypnosis from propofol alone does not constitute general anesthesia. Patients move in response to inadequate local. Propofol-ketamine technique is a MAC, not a general anesthetic.

When Dr. Einstein says, in conclusion, 'having spoken to patients . . .,' he is admitting his own lack of personal experience administering ketamine. Unreferenced criticism based on hearsay and innuendo cannot be equated with a referenced article based on sound principles and safe practice. Dr. Einstein's perspective, while clearly reflective of mainstream anesthesia practice, is essentially 'my mind is made up, please don't confuse me with the facts.'

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