ORIGINAL ARTICLE

Contact topical anesthesia for strabismus surgery in adult patients

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KEYWORDS
Strabismus;
Local anesthesia;
Ambulatory surgical procedures;
Postoperative pain

Abstract
Objective: To analyze the effectiveness and usefulness of contact topical anesthesia in strabismus surgery in adult patients.
Material and methods: A prospective study was conducted on 20 patients undergoing strabismus surgery using contact topical anesthesia and sedation with remifentanil. The intensity of pain was recorded using a numeric pain rating scale at the time of anesthesia implementation, during the surgical procedure, 30 min afterwards, and during the first postoperative day. The incidence of oculocardiac reflex, postoperative nausea and vomiting, corneal ulcers, patient satisfaction (numerically from 0 to 10) and the degree of residual ocular deviation were also assessed.
Results: The operation was performed successfully in all patients. Average pain intensity was 1.40 ± 1.73 during anesthesia implementation, 4.20 ± 2.57 during the surgical procedure, 2.50 ± 2.54 30 min after surgery, and 3.55 ± 2.89 during the first postoperative day. Oculocardiac reflex was observed in seven patients (35%), postoperative nausea and vomiting in four (20%), and corneal ulcer in four (20%). The patient satisfaction was 9.53 ± 2.51. More than two-thirds (70%) of patients had a residual ocular deviation less than 10 prism diopters.
Conclusions: Contact topical anesthesia is a safe and effective alternative for strabismus surgery in adult patients. Contact topical anesthesia provides adequate pain control, lower incidence of postoperative nausea and vomiting and oculocardiac reflex, and optimal setting of ocular alignment.
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PALABRAS CLAVE
Estrabismo; Anestesia local; Procedimientos quirúrgicos ambulatorios; Dolor posoperatorio

Anestesia tópica de contacto para cirugía de estrabismo

Resumen
Objetivo: Analizar la eficacia y utilidad de la anestesia tópica de contacto en cirugía de estrabismo en pacientes adultos.
Material y método: Estudio prospectivo de 20 pacientes intervenidos de estrabismo utilizando anestesia tópica de contacto más sedación con remifentanilo. Mediante la escala numérica del dolor se registró la intensidad de este en el momento de la aplicación de la anestesia, durante la intervención quirúrgica, a los 30 min y durante el primer día posoperatorio. Se valoró la aparición de reflejo oculocardíaco durante la intervención, la incidencia de náuseas y vómitos posoperatorios, la presencia de úlceras corneales, la satisfacción de los pacientes de forma numérica del 0 al 10, y el grado de desvivación ocular residual.
Resultados: La intervención quirúrgica se realizó de forma satisfactoria en todos los pacientes. La intensidad del dolor fue de $1,40 \pm 1,73$ en el momento de la aplicación de la anestesia; $4,20 \pm 2,57$ durante el desarrollo de la intervención; $2,50 \pm 2,54$ a los 30 min, y $3,55 \pm 2,89$ durante el primer día posoperatorio. Se observó aparición de reflejo oculocardíaco en 7 pacientes (35%), náuseas y vómitos posoperatorios en 4 (20%), y úlceras corneales en 4 (20%). La satisfacción de los pacientes alcanzó un valor promedio de $9,53 \pm 2,51$. El 70% de los pacientes presentaban una desvivación ocular residual menor a 10 dioptrías prismáticas.
Conclusiones: La anestesia tópica de contacto es una alternativa segura y eficaz para la cirugía del estrabismo en pacientes adultos. Permite un adecuado control del dolor, ofrece una baja incidencia de reflejo oculocardíaco y náuseas y vómitos posoperatorios, y proporciona un ajuste óptimo de la alineación ocular.
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Introduction

The development of locoregional anesthesia in eye surgery has reduced anesthetic risk and postoperative recovery time, both of which are fundamental factors to be taken into account in day surgery. Although strabismus surgery is usually performed under general anesthesia, there is a growing tendency in hospitals to use locoregional techniques in adult patients.

A variety of locoregional anesthesia techniques have been used in strabismus surgery. Contact topical anesthesia (CTA) is a non-invasive technique with very few adverse effects that has been used in a wide variety of ocular surgery procedures.\(^1\) In strabismus surgery in adult patients, CTA has been shown to be a safe, effective and pain-free alternative to general anesthesia.\(^2\)

We present the results of an observational study of 20 adult patients undergoing strabismus surgery with CTA and conscious sedation with remifentanil. The parameters measured were anesthetic effectiveness and other benefits associated with the technique, such as better management of pain and postoperative nausea and vomiting (PONV), suppression of the oculocardiac reflex (OCR), and post-surgery ocular alignment.

Materials and methods

Prospective study of a cohort of 20 adult patients diagnosed with strabismus and undergoing lateral rectus recession and/or resection using CTA in the day surgery unit of our hospital. The study was approved by the Clinical Research Ethics Committee. All adult patients scheduled for strabismus surgery in our hospital between 2012 and 2013 that agreed to take part in the study were included. Exclusion criteria were: foreseeable technical difficulties due to prior ocular surgery or other associated ocular problems, history of SAHS, psychiatric disorders (dementia, anxiety disorder), and sensitivity to any of the study drugs.

Following instillation of topical anesthetic drops containing 0.4% oxybuprocaine plus 0.1% tetracaine (Colircusi Anestésico Doble®), Laboratorio Alcon Cusi, S. A., Barcelona, Spain), we proceeded to apply the CTA. A 2 cm x 2 cm pad of Spongostan® (Johnson & Johnson Medical Limited, Gargrave, Skipton, UK) was impregnated with a 1:1 solution of 2% lidocaine and 0.75% bupivacaine. Using forceps, the sponge was placed in the conjunctival fornix on the side of the muscles to be treated. Patients were then asked to close their eyes for 5 min to maximize penetration of the anesthetic (Fig. 1). All patients were sedated with IV midazolam 0.2 mg/kg\(^{-1}\) and continuous IV remifentanil infusion (0.02–0.1 μg/kg\(^{-1}\)/min\(^{-1}\)) to maintain a sedation level of 2–3 on the Ramsay Sedation Scale. During the procedure, patients were monitored using pulse oximetry, ECG, non-invasive arterial pressure, and bispectral index.

All surgeries were performed by the same surgeon, and involved complete dissection of one of the lateral and/or medial rectus muscles and suture to the sclera (recession), or to the same muscle (resection). In all cases, size 6/0 absorbable Vycryl® sutures were used (Ethicon Inc., Somerville, NJ, USA).
Contact topical anesthesia for strabismus surgery in adult patients

CTA efficacy was determined by the number of cases requiring deeper sedation (Ramsay >3) or need to change the anesthetic technique due to discomfort that prevented completion of the procedure. The patient-perceived level of pain during application of the anesthesia, during the procedure, 30 min post-surgery, and during the first postoperative day (maximum level of pain reported in the first 24 h) was recorded. Pain was evaluated using the Pain Number Scale (PNS) (Table 1), in which patients grade their pain according to a scale that ranges from no pain (0) to the worst pain imaginable (10). If the patient reported pain or discomfort during the procedure, 2% lidocaine drops were instilled, and greater care was taken with surgical manipulation. Postoperative analgesia consisted of IV paracetamol 1 g and IV dexketoprofen 5 mg before the end of surgery, and oral paracetamol 1 g/8 h for 24 h post-surgery if the patient reported pain (Table 2).

PONV prophylaxis followed the protocol used in our hospital for this type of surgery (IV dexamethasone 4 mg in all patients, IV ondansetron 4 mg in patients with an Apfel³ PONV risk score of ≥2).

Onset of OCR and the need for atropine were noted, during both anesthesia application and surgery. OCR was defined as a 20% (minimum) decrease in heart rate associated with ocular manipulation. IV Atropine 10 μg/kg⁻¹ was given if OCR did not resolve with more careful manipulation, or if the patient experienced dizziness, nausea, or hypertension. Onset of PONV in the immediate postoperative period (in the recovery room) was also noted, together with late-onset PONV (first 24 h post-surgery).

One day after surgery, the degree of residual ocular deviation and the presence of corneal ulcers were recorded. Patients were asked to rate their satisfaction with the procedure on a scale of 0–10, and were also asked if they would accept the same anesthesia technique if they needed further surgery.

The data collected were analyzed using SPSS® 15.0 (IBM Corp., Armonk, NY, USA).

Results

Of the 20 study patients, 8 (40%) underwent recession or resection of a single rectus muscle, and 12 (60%) underwent recession or resection of both the lateral and medial rectus muscles. Mean age of study patients was 49.0 ± 16.2 years, with a range of 19–81 years; 11 (55%) were men.

Surgery was successful in all patients. The anesthetic technique remained unchanged in any patients, although one patient required deeper sedation (Ramsay >3) due to pain during surgery that could not be adequately controlled with local anesthesia. The average level of pain reported by patients, measured on the NPS, was 1.40 ± 1.73 when anesthesia was applied; 4.20 ± 2.57 during surgery; 2.50 ± 2.54 at 30 min post-surgery, and 3.55 ± 2.89 during the first postoperative day.

During application of anesthesia, one patient (5%) presented OCR and required atropine. Onset of OCR during surgical manipulation occurred in seven patients (35%), of whom six required atropine.

During the immediate postoperative period, four patients (20%) presented PONV, and were successfully treated with IV droperidol 1.25 mg. Following discharge, none of the patients reported PONV during the first postoperative day.

During next day follow-up, 4 patients (20%) presented corneal ulcers. Of these, the average NPS during the first postoperative day was 6.25 ± 3.30.

In terms of patient satisfaction, the average self-perceived well-being score was 9.53 ± 2.51. All patients said they would accept the same anesthetic technique if further surgery was required.

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**Table 1** Pain levels graded on the PNS.

<table>
<thead>
<tr>
<th>Application of anesthesia</th>
<th>1.40 ± 1.73</th>
</tr>
</thead>
<tbody>
<tr>
<td>During surgery</td>
<td>4.20 ± 2.57</td>
</tr>
<tr>
<td>At 30 minutes</td>
<td>2.50 ± 2.54</td>
</tr>
<tr>
<td>First 20 hours</td>
<td>3.55 ± 2.89</td>
</tr>
</tbody>
</table>

Data expressed as mean ± standard deviation.

**Table 2** Perioperative incidents.

<table>
<thead>
<tr>
<th>Incident</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of anesthesia technique</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Need for deeper sedation</td>
<td>1 (5)</td>
</tr>
<tr>
<td>OCR during anesthesia application</td>
<td>1 (5)</td>
</tr>
<tr>
<td>OCR during surgery</td>
<td>7 (35)</td>
</tr>
<tr>
<td>PONV during immediate postoperative period</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Late-onset PONV</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Postoperative corneal ulcer</td>
<td>4 (20)</td>
</tr>
</tbody>
</table>

OCR, ocularcardiac reflex; PONV, postoperative nausea and vomiting. Data expressed as number of patients (percentage).
As far as outcomes are concerned, 14 patients (70%) presented orthophoria (alignment of both eyes) or a residual ocular deviation of less than 10 prism diopters 1 day post-surgery.

Discussion

Topical anesthesia has been used successfully in strabismus surgery in adult patients.\textsuperscript{6,7,11,12} It is a non-invasive technique with very few adverse effects that is fast replacing other locoregional anesthesia techniques, such as retrobulbar, peribulbar or sub-Tenon’s block. These latter techniques are associated with complications that can irreversibly affect visual acuity, and even endanger the patient’s life.\textsuperscript{11,12} Despite the fact that strabismus surgery can be performed using topical anesthesia with no major complications, some patients feel discomfort during rectus muscle dissection and manipulation,\textsuperscript{6,7,11,12} and greater care with surgical manipulation and/or appropriate sedation is needed to prevent discomfort.

CTA is a topical anesthesia technique that involves applying an anesthetic-soaked gelatin sponge to the surface of the eye. The aim is to maximize penetration of the local anesthetic in the conjunctiva to obtain a deeper anesthetic effect and improve patient comfort. In some cases, however, anesthesia may not be deep enough, and patients will report discomfort during the procedure. Pablo et al. reported excellent pain management with CTA during trabeculectomy and phacotrabeculectomy.\textsuperscript{1,2} Aziz and Rageh,\textsuperscript{3} using CTA for strabismus surgery, observed that some patients reported discomfort during manipulation of the medial rectus muscle, although none required general anesthesia. In our study, we decided to combine CTA with sedation using IV remifentanil perfusion to reduce patient discomfort during the procedure as far as possible. In addition to its analgesic effects, remifentanil is known to induce conscious sedation and facilitate patient cooperation during surgery,\textsuperscript{13,14} which is particularly useful when evaluating ocular motility. In our study, the average pain level reported by patients during the procedure was 4.20 ± 2.57 out of 10 on the NPS. Additional sedation was only required in 1 patient, who referred a pain level of 5 on the NPS. General anesthesia was not required in any of our patients.

Strabismus surgery is one of the most painful of all ocular surgery procedures, and the analgesic action of locoregional anesthetics during the postoperative period is particularly beneficial. The local anesthetic combination used in our study had both a fast-acting and long-term analgesic effect. During the first postoperative day, patients rated their pain level at 3.55 ± 2.89 on the NPS.

OCR is a common intraoperative complication of strabismus surgery due to manipulation of extraocular muscles. The exact incidence of OCR in strabismus surgery in adults is unknown, since not all authors agree on the definition of OCR, and most estimations of incidence are based on data from the pediatric population. In any event, several studies have shown a reduction in the rate of OCR when locoregional anesthesia is used. Ruta et al.\textsuperscript{15} reported fewer cases of OCR in children receiving topical lidocaine than those receiving general anesthesia (37.1% vs 86.1%). Snir et al.\textsuperscript{16} also observed a lower rate of OCR in adults treated with topical anesthesia compared to general anesthesia (18.8% vs 50%). In a study of 40 adult patients receiving topical lidocaine 2% gel, no cases of OCR were reported.\textsuperscript{17} In our population, we have observed OCR in 35% of patients undergoing strabismus surgery under CTA.

Another common complication of strabismus surgery is PONV. This occurs in up to 50% of adult patients receiving general anesthesia.\textsuperscript{2,16} Incidence of PONV is also reduced when using locoregional anesthesia.\textsuperscript{16,17} In our cohort of patients receiving CTA plus our standard PONV protocol, incidence was just 20%. None of our patients presented late-onset PONV (at 24 h).

The preservation of ocular motility under topical anesthesia enables surgeons to perform intraoperative assessment of ocular alignment. Several authors maintain that preservation of movement and patient collaboration under topical anesthesia allow surgeons to maximize precision in ocular alignment. This, in turn, reduces the re-intervention rate.\textsuperscript{7,8,10,17,19} Most studies consider a residual ocular deviation of less than 10 prism diopters to be a satisfactory outcome in ocular surgery. Of the 20 patients receiving CTA, next day follow-up showed a deviation of less than 10 prism diopters in 14 (70%) patients. Over the following months, this proportion increased to 90% after ocular exercises and reduction of perioperative inflammation.

One of the main limitations of our study is the sample size; this was due to the small number of strabismus interventions in adults compared to the pediatric population. Future studies should include a larger cohort and compare CTA with other anesthesia techniques to give a clearer picture of its benefits in strabismus surgery.

Our findings show that CTA shortens postoperative recovery time and provides reliable pain control, and is a safe and effective alternative to general anesthesia in strabismus surgery in adults. Preservation of intraoperative ocular motility allows surgeons to adjust ocular alignment with greater precision. Further studies are needed to compare the advantages of CTA over general anesthesia and other locoregional anesthesia techniques.

Conflict of interest

The authors declare they have no conflict of interest.

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