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CASE STUDY

Transient lip burn and discoloration due to Carnoy's solution, an intraoperative mishap: A Case Report

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ABSTRACT

Carnoy's solution, initially used as a slide fixator in laboratory pathology, is extensively used clinically inside the cyst to facilitate a complete removal of the cystic membrane or directly over the bony bed after the cyst enucleation to detect and eliminate the remaining epithelium of the KOT to diminish the likelihood of a recurrence. Penetration is one of important factors of Camoy' s solution leading to tissue damage Carnoy's solution have great penetrating power on the mucosa, and they can destroy the epithelia and subcutaneous tissue. It possesses an acidic characteristic. This report presents a case of a patient having an adverse reaction in the lip after an accidental application of carnoys solution intraoperatively during the enucleation and conservative management of odontogenic keratocyst Volume of Carnoy's solution should be limited to the necessary amount to soak the gauze without over flowing to the surrounding tissue, with an estimative of less than 1ml cm

Keywords*: Carnoy's solution, chemical burn, odontogenic keratocyst, tissue necrosis, topical corticosteroids.*

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INTRODUCTION

The odontogenic keratocyst is a relatively common developmental odontogenic cyst that represents approximately 10% to 14% of all jaw cysts. Basilar nuclear palisading and the production of keratin (primarily in the form of parakeratin) are the microscopic distinctive characteristics of this lesion. potentially aggressive presentation and molecular findings has raised a controversy in recent years over whether this lesion should be classified as a cyst or a tumor [1].

The aggressive behavior and high rate of recurrence of keratocysts warrants an aggressive treatment strategy. Resection of the jaw results in the lowest recurrence rate. However, considering the radical nature of the procedure, enucleation in combination with Carnoy's solution or marsupialization is acceptable choice of treatment unless resection is absolutely needed.

Carnoy's solution, initially used as a slide fixator in laboratory pathology [1], is a cauterizing agent that causes a rapid local fixation. The solution can be used inside the cyst to facilitate a complete removal of

the cystic membrane or directly over the bony bed after the cyst enucleation to detect and eliminate the remaining epithelium of the KOT to diminish the likelihood of a recurrence.[1] It is applied in the bone cavity for the purpose of eliminating the tumour tissue remnants by promoting a superficial chemical necrosis of up to 1.5 mm. [2]

Dehiscence, postoperative infection, nerve injuries causing temporary toxicity paresthesia are the stated undesirable effects caused by Carnoy's solution. however, there is a paucity of effect of carnoys solution on normal tissues.

We present a case report of a patient having an adverse reaction in the lip of the patient after an accidental application of carnoys solution intraoperatively during the enucleation and conservative management of odontogenic keratocyst. This is the first ever reported case in the literature to the best of our knowledge.

Case report:

A 33-year-old woman was surgically operated for odontogenic keratocysts which was histologically confirmed after incisional biopsy. Enucleation of the lesion by intraoral approach and removal of the involved teeth were accomplished under general anesthesia. Soft tissues adhering to the capsule of the lesion in the lingual fenestration were also removed and Then, peripheral ostectomy of the whole surgical bed was completed, followed by a single application of Carnoy's solution.

The carnoy's solution was soaked into a single large gauze piece then applied into the cystic cavity that remained after enucleation and peripheral osteotomy. It is assumed that while placing the carnoy's solution-soaked gauze into the cavity it may have inadvertently touched a part of lower lip and corner of the mouth. Within a few minutes it was observed that the region of the lip that had contacted the carnoy's solution became oedematous and tense. The swelling continued to grow until immediately intra operatively the patient was administered 100mg of Injection Hydrocortisone intravenously. In the immediate postoperative period, the patient presented with discolouration of the lower lip and necrosis of skin and mucosa of the affected region which had a total regression after 3 weeks.

DISCUSSION

Named after J.P. Carnoy, a 19th century Belgian cytologist who developed the mixture as a fixative for tissue samples is a caustic mixture of chemicals. Clinical application of Carnoy's solution came in the year 1973, after a land mark study by Stoelinga and Peters [4] in 1973 clinical application of carnoys solution gained its importance. This study demonstrated a lower recurrence rate (2.5%) in patients treated by enucleation with chemical cauterisation than the patients who were treated by enucleation alone (13.5%). [4]

Carnoy's solution is a cauterizing agent composed of 3 ml of chloroform, 6 ml of absolute ethanol, 1 ml of glacial acetic acid, and 1 g of ferric chloride, it is often used as a complementary treatment of lesions with high recurrence rates, such as the keratocystic odontogenic tumor (KOT). [blana and zoa) with moderate tissue penetration, rapid local fixation, and haemostatic action is most common adjuvant therapy in the conservative management of OKC. The solution is usually applied over the surgical bony bed after enucleation and is found to produce a superficial necrosis of about 1.5 mm deep,12 thereby providing a safety margin in the treatment of invasive neoplasm. The study of Gosau et al. [3] found that odontogenic keratocysts treated by means of enucleation plus CS had a recurrence rate of 14.3% whereas the cases treated with enucleation alone had a 50% of recurrences

Ethanol (CH2H5OH) in the carnoys solution is a coagulative fixative that denature insoluble proteins in water at room temperature and extract phospholipids from cells without affecting the carbohydrates, principally when in major concentration in the solution (described as solvent). Chloroform ($CHCl_3$) a compound with lipophilic nature improves the dehydration of tissues by dissolving the lipids in membranes, favoring the action of ethanol in the process. Glacial acetic acid (CH_3COOH) penetrates rapidly in tissues and causes coagulation of nucleic acids, it breaks the cross-links between proteins and releases hydrophilic radicals,leading to tissue swelling ,thereby preventing the excessive shrinking and stiffening promoted by ethanol action.[3, 4] Ferric chloride (FeCl3) is a brownish chemical agent with acidic and protein coagulating properties, which provides its characteristics as strong hemostatic agent. The presence of this ferric chloride is the most probable cause of lip discolouration in our case.

Complications of carnoys solution as stated in the introduction include infection, dehiscence, bone sequestrum formation, and neuropathy. [4] Frerich *et al*., 1994 suggested that the application of Carnoy's solution should not exceed 3–5 min. Chloroform (Trichloromethane) is possibly carcinogenic to humans [6].

Penetration is one of important factors of Camoy' s solution leading to tissue damage Carnoy's solution have great penetrating power on the mucosa, and they can destroy the epithelia and subcutaneous tissue. It possesses an acidic characteristic, it is stable when stored at room temperature, and precipitates iron salts when in the presence of chloroform in a nonfiltered solution. The chloroform increases the viscosity of the solution and makes its pH slightly more acidic. this acidic nature is the probable cause of chemical burn in our case. The difference in depth of penetration on different tissue may be related to their structure. Carnoys solution causes drying and cracking of tissues which can lead to secondary infections and dermatitis.

Volume of Carnoy's solution should be limited to the necessary amount to soak the gauze without over flowing to the surrounding tissue, with an estimative of less than 1ml cm -3. It is also recommended that instead of one large piece of gauze multiple counted small pieces of gauze or cotton should be used. This will not only prevent damage to adjacent tissues but also allow the application of carnoy's solution to the deeper and otherwise inaccessible areas of the cystic cavity [7]. During this surgical step and regardless of the size of the lesion, careful reflection of the surrounding tissues with constant aspiration as well as conspicuous irrigation with saline should be emphasized.

The early detection and the immediate institution of therapeutic measures will ensure a rapid cure and possibly prevent further mucosal damage. the therapeutic measures recommended and taken by the surgeons were removal of the agent and Copious irrigation with normal saline. Analgesia for pain and antibiotics may be required for prevention of secondary infections, however in our case the patient was on analgesics and iv antibiotics post operatively for 5 days, increased period of infusion or dose was not needed. Topical application of the corticosteroids and benzocaine was done for 3 weeks. Nutritional supplements in the form of multivitamins were given to improve the healing. Follow up was done. Complete remission was seen in 3 weeks; by re-epithelization of the wound, no scaring or pain was noted.

Fig 1& 2: post-operative pic, showing discoloration and necrosis of lip at the corner of the mouth.

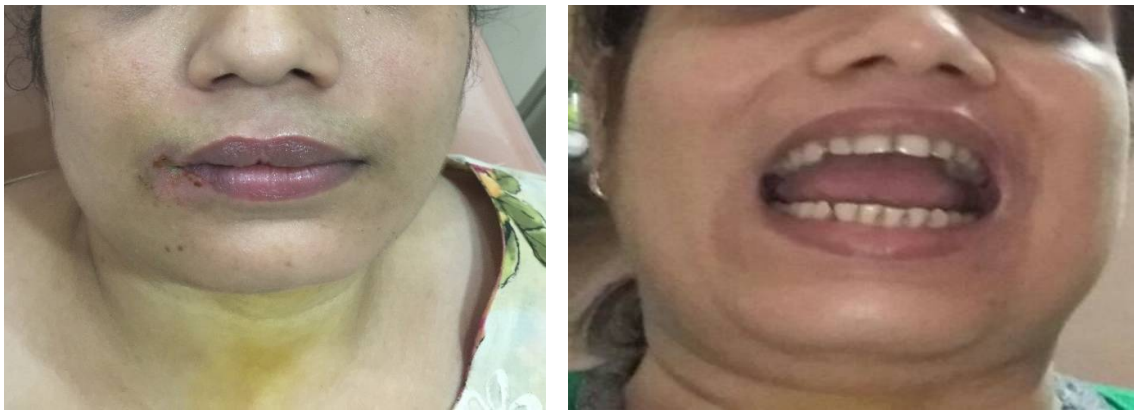

Fig 3 & 4: 3 weeks post operatively shows no discoloration and necrosis

CONCLUSION

The oral injuries caused due to chemical burn with carnoys did not cause any permanent effect in this case, however judicious use of the solution is recommended to avoid patient discomfort and added post-surgical care. Management depends on the proper identification of the etiology and therapeutic treatment with topical corticosteroids and antibiotics to avoid secondary infections.

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