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Original Article

The effectiveness of Lidocaine Vs Tetracaine as topical anesthetic agents for removal of corneal stitches

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ABSTRACT

Aim: to compare the effectiveness of the use of topical lidocaine 1% compared to topical tetracaine 1% anesthesia for removal of corneal stitches in postoperative extra- capsular cataract extraction. Method: Single-masked, randomized prospective study performed in two Royal Medical Services hospitals in Jordan ;prince Rashed bin Alhassan hospital and Prince Ali bin Al-hussein hospital between August 2011 and January 2012. All patients previously underwent extra capsular cataract extraction surgery and scheduled for removal of corneal stitches were included in this study, patient with previous external ocular inflammatory conditions and those with previous use of any topical ophthalmic medications were excluded from this study. One hundred patients who fit the inclusive criteria were divided into 2 equal groups the 1st group (group A) are those who received topical lidocaine 1% and the 2nd group (group B) are those who received topical tetracaine 1%. The topical medication of each type was installed into the lower eye fornix and the Patients in both groups were reviewed regarding stinging sensation, onset of action of the topical anesthesia, pain sensation during stitches removal and duration of the whole procedure. Results:In group A; patients experienced stinging sensation for 4 to13 second (average 8 seconds) with onset of action ranged from 60 to 270 seconds (average 130 seconds), 72% of patients didn't experience any pain, 22% felt mild tolerable pain, 6%of patients continued suffering from severe pain and the average time required for the complete removal of the stitches was 184 seconds. In group B; patients experienced stinging sensation for 7 to21 second (average 17 seconds) with onset of action ranged from 210 to 540 seconds (average 380 seconds), 52% of patients didn't experience any pain, 28% felt mild tolerable pain, 20%of patients continued suffering from severe pain and the average time required for the complete removal of the stitches was 279

1. Introduction

Topical anesthesia is considered one of the important modalities of providing pain relief in minor ophthalmic procedures for example applanation tonometry, removal of corneal and conjunctivalforeign bodies, chalazion incision , pterygium excision, insertion of a medical instrument in the eyes and removal of corneal stitches[1]. Also it is used therapeutically for relieving pain as a result of minor injuries like photo keratatis.In addition to that it has been used in major ophthalmic procedures like cataract [2] and glaucoma [3] surgery.

A lot of drugs have been used as topical anesthetics in ophthalmology like tetracaine (Amethocaine), lidocaine,proparacaine [4] and oxybuprocaine [5]. Lidocaine in which the active ingredient is lidocaine hydrochloride is considered one of the amino amide-type local anesthetic, first synthesized by Swedish chemist Nils Lofgren in 1943, and marketed in 1949[6,7]. Its action is by alteration of the depolarization in neurons as a result of sodium channels blockage in the cell membrane. It has rapid onset and long duration of action [8].Tetracaine is apara-aminobenzoic ester local anesthetic, its action results from blockage of nerve conduction by decreasing

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nerve membrane permeability to sodium [9].Both lidocaine and tetracaine are available as solution or gel for topical anesthesia.

In Jordan, particularly in Royal Medical Services hospitals cataract surgery remains the commonest ophthalmic operation performed, most of the cases are performed by extra capsular cataract extraction (ECCE)through limbal incision and closure is achieved by using non-absorbable 10/0 Nylon , this procedure necessitate stitches removal approximately two months postoperatively, the aim of this study was to compare the effectiveness of the use of topical lidocaine 1% compared to topical tetracaine 1% anesthesia in post cataract stitches removal , in Royal Medical Services hospitals both lidocaine and tetracaine are available only in the form of preservative free solutions.

2. Materials and Method

This is aSingle-masked, randomized prospective study performed in two Royal Medical Services hospitals in Jordan ;prince Rashed bin Alhassan hospital and Prince Ali bin Al-hussein hospital between August 2011 and January 2012. All patients previously underwent extra capsular cataract extraction surgery and scheduled for removal of corneal stitches were included in this study, patient with previous external ocular inflammatory conditions like herpetic or adeno keratitis and those with previous use of any topical ophthalmic medications especially steroids or non-steroidal anti-inflammatory drugs were excluded from this study. The 1st one hundred patients who fit the inclusive criteria were divided randomly into 2 equal groups the 1st one (group A)are those who received topical lidocaine 1% and the 2nd one (group B) are those who received topical tetracaine 1%. The topical medication of either type was installed into the lower eye fornix and the Patients were asked to close their eyes, then they were observed and asked to record the time at which the stinging sensation disappears. The onset of the topical medications is tested by detection corneal desensitization through cotton swap, then an attempt for removal of the stitches done and the patient was asked to report whether if there is pain or not , if pain is present the patient was asked to describe if it is mild tolerated or severe not tolerated and if the pain is severe not tolerated the patient will be exposed to another single drop of the topical medication and another attempt for corneal stitches removal and evaluation of the patient comfort is done.The time needed for completion of the whole procedure is recorded.After collection of the data the results from the two groups were compared and a statistical analysis wasperformed.

3. Results

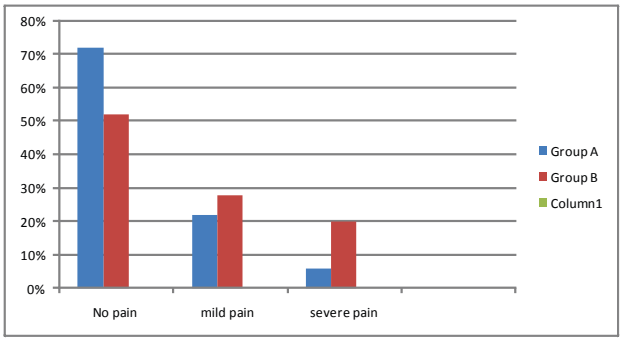
The age of all patients included in this study ranged between 42 and 73 years (average 56 years), 52 of the patients were males, there was no statistical difference between the two groups regarding age and sex. Regarding the stinging sensation; Group A patients experienced stinging sensation for 4 to13 second (average 8 seconds), while those in group B experienced stinging sensation for 7 to 21seconds (average 17 seconds).In group A patients, the stinging sensation was mild in 68% of patients, moderate in 20 % of patients and severe in 12% of the patients, while in group B it was mild in 44% of patients, moderate in 32 % of patients and severe in 24% of the patients.

Regarding the onset of action in group A patients, the onset of action of the topical lidocaine ranged from 60 to 270 seconds (average 130 seconds), while it ranged from 210 to 540 seconds (average 380 seconds) in group B patients. In group A patients 72% of patients didn't experience any pain throughout the procedure compared to 52% of patients in group B. The percentage of patients who experienced mild tolerable pain was 22% in group A and 28% in group B patients. In group B patients 20% of them (10 patients) continued suffering from severe pain that required installation of another drop of tetracaine after which 2 patients experienced complete relief of pain, 8 patients continued feeling of mild tolerated pain and 2 patients continued feeling of severe pain, while in group A only 6%of patients continued suffering from severe pain which was completely relieved installation of another drop of lidocaine. The average time required for the complete removal of the stitches was 184 seconds and 279 seconds in group A and B respectively. All the results are summarized in table [1].

Table 1

Group A	Group B
Average stinging sensation period (seconds)	8
Time of onset (seconds)	130
Percentage of patients without pain feeling	72%
Percentage of patients felt mild tolerable	22%
PainPercentage of patients felt sever non-tolerable pain average time required for	6%
Complete removal of the stitches (seconds)	184

Figure



4. Discussion

The age of all patients included in this study ranged between 42 and 73 years (average 56 years), 52 of the patients were males, there was no statistical difference between the two groups regarding age and sex. Regarding the stinging sensation; Group A patients experienced stinging sensation for 4 to13 second (average 8 seconds), while those in group B experienced stinging sensation for 7 to 21seconds (average 17 seconds).In group A patients, the stinging sensation was mild in 68% of patients, moderate in 20 % of patients and severe in 12% of the patients, while in group B it was mild in 44% of patients, moderate in 32 % of patients and severe in 24% of the patients.

4. Discussion

Cataract is still considered the commonest cause of revisable blindness in the world [10]. The only treatment available for cataract is through surgery, there has been rapid turnover and continuous advances in performing cataract surgery, the latest method is by Phacoemulsification, it is estimated that 99% of cataract operations in the UK are treated using this technique [11], however in developing countries like Jordan majority of cataract cases are performed using the older technique which is extra capsular cataract extraction (ECCE) especially in the public sector. In Royal Medical Services hospital Phacoemulsification technique is available in only two out of seven hospitals, in prince Rashed bin Alhassan hospital and Prince Ali bin Al-hussein hospital most of the cataract surgeries are performed using the older technique through limbal incision and closure of the wound is achieved by using non-absorbable 10/0 Nylon, this procedure necessitate stitches removal approximately two months postoperatively. Removal of stitches is done at the ophthalmology clinic using slit lamp biomicroscope, first installation of the topical anesthetic agent in the lower fornix and the patients were asked to avoid frequent blinking and forceful closure of the eye lids so as to minimize drug washout through the lacrimal drainage system, then the stitches are cut by 27 Gauge needle and removed using a tying forceps, this procedure may take short or long period of time depending on the patient's cooperation, the effectiveness of the topical anesthetic agents significantly influence the patient's cooperation, patients become uncooperative to any procedure when they experience pain or drug side effect during performing this procedure. Each anesthetic agent has some advantages and disadvantages, the ideal anesthetic agent should have rapid onset of action, long duration of action that covers the whole procedure, complete relief of pain and minimal side effects. In Royal Medical Services hospital the only topical anesthetic agent available in ophthalmologic practice are preservative free tetracaine and lidocaine solution. It is essential to know which is more effective to be used in minor ophthalmic procedures like removal of corneal stitches which is one of the common procedures performed in the ophthalmology clinics of our hospitals.

There was no statistical difference between the two groups regarding age and sex, the stinging sensation of the anesthetic agents is considered the most common temporary adverse reaction of the anesthetic agents, the difference in the stinging sensation between different type of topical anesthetics is attributed to the osmolarity and the PH of the product, hypertonic solutions cause more stinging sensation than hypotonic ones[12], and the higher the difference between the PH of the topical anesthetic and the physiological PH (7.4) the greater the feeling of the stinging sensation will occur, this explains why stinging sensation was more prominent and severe in group B patients since tetracaine has a PH of 4.54(13) compared to 6.0 that of lidocaine [14,15]. Another advantage of lidocaine observed in this study was its rapid onset of action(130 seconds) which was about 1/3 that of tetracaine (380 seconds),thus lidocaine was superior to tetracaine in leading to rapid comfort of the patient , the difference of the onset of action is attributed to the difference in the pharmacological properties of the two drugs since each belongs to different group, the results in this study regarding the onset of action was close to that found in the literature in which it was described that the onset of action of topical lidocaine and tetracaine to be 1-5 minutes and 3-10 minutes respectively.

Regarding feeling of pain during stitches removal, the results of the two groups are summarized in figure 1.If we consider that no or mild pain experience is satisfactory It is clear that lidocaine was effective in 94% of patients in group A compared to 80% of patients in group B, this result is mostly due to the difference in penetration of the two drugs to tissues, All patient in Group A who suffered from severe pain improved with installation of another drop of the anesthetic agent, the explanation for that is the higher tissue concentration of the anesthetic agent achieved with installation of the second drug. While those in group B only 2 out of 12 patients had complete relief of pain and 8 had partial relief of pain. This is again mostly due to the difference in penetration. This all emphasize the superiority of lidocaine over tetracaine regarding the effectiveness for pain relief during stitches removal. The time needed to complete the stitches removal was higher in patients of group B (279 seconds) compared to those of group A (184 seconds), this is attributed to the patient's cooperativeness which reflects the effectiveness of the topical anesthesia that was more prominent in group A. the duration of action of the two anesthetic agents was not tested because of the relatively short time of this ophthalmic procedure, however many studied showed that lidocaine has longer action that tetracaine[14],this is because The ester compounds (tetracaine) are rapidly hydrolysed by plasmatic esterasis, and to a lesser extent by tissue esterasis while amidecompounds (lidocaine) are degraded more slowly, mainly in the liver rather than the eye [16].

Although this study was based mainly on the subjective description of patients that is considered the main limitation of the study but it obviously showed that the superiority of lidocaine 1% topical anesthesia to tetracaine 1% topical anesthesia in the removal of stitches of postoperative extra-capsular cataract extraction patients for all of the studied parametersand showed less stinging sensation, rapid onset of action, effectiveness of pain relief and less duration of the procedure, the effectiveness of lidocaine was more satisfactory for both the patients and the ophthalmologist in performing minor ophthalmic procedures like removal of corneal stitches.Its affectivity may be applied also to other minor ophthalmic procedures.

5. Conclusion

Lidocaine is one of the well tolerated and effective local anesthesia agents and showed its superiority to tetracaine in minor ophthalmic procedures; we recommend using it for corneal stitches removal in post cataract surgery patients.

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