

Comparative Study Between Histoacryl And Suture For Tonsillar Bleeding (An Experimental Study)

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ABSTRACT

This work was planned to evaluate using the N-butyl cyanoacrylate adhesive (Histoacryl) in experimental tonsillectomy through macroscopic and histological assay compared to the common used ligation method. The study was conducted on 12 apparently healthy dogs of native breed ranged from 3-12 months of age and weight 5-12Kg. The animals divided into two separate groups of 6 dogs. The tonsils were removed in the two groups. Hemostasis of the blood supply of the removed tonsils by suture ligation was used in one group and by application of tissue adhesive, monomeric n-butyl-2-cyanoacrylate, Histoacryl (B. Braun Petzold GmbH Schwarzenberger Weg Germany) on vascular bed in the second group. The animals were daily observed and clinically examined for 6 weeks. One animal from each group was sacrificed weekly until the end of the experiment and tissue specimens were obtained from the tonsillar fossa of animals for histopathological examination. Statistical analysis of the data of the clinical examination (temperature, pulse & respiration) was carried out. Moderate morbidity and increase in pulse and respiratory rates during the first day of post operation were noticed in the suture ligation group. Mild depression and non-significant change in body temperature, pulse and respiratory rate were observed in the group of Histoacryl application. Histopathological examination of specimens taken from the sacrificed animals of the first group revealed revitalization of the epithelium and more leucocytic infiltration after one week of the operation and nearly complete healing of wounds and collagen fibrosis three weeks post operation. Whereas mild inflammatory reaction and complete healing were observed after two weeks from application of Histoacryl in the second group. It was concluded that using of N-butyl-cyanoacrylate was superior to conventional suture ligation technique in tonsillectomy by virtue of its speed, ease, and accuracy of application. It provides effective hemostasis with good systemic and local compatibility in addition to no adverse inflammation. Further studies, including clinical trials are needed to assess using of N-butyl-cyanoacrylate in humans tonsillectomy.

INTRODUCTION

The tonsils are two masses of lymphoid tissues on the back of throat and help fight against infections (1). However, in some people, particularly in children with larger tonsils, they can perform less efficiently; frequent throat and ear infections were accompanied, breathing was obstructed and chronic cryptic tonsillitis resulted. In these cases, tonsillectomy is beneficial. There seems to be no adverse effect on the immune status or health of patients who have had them removed (2).

Improved anesthetic and surgical techniques have made these operations safer

procedures than in the past (3). There are a variety of traditional surgical approaches have been developed in the hope of decreasing the operative time and postoperative pain in addition to bleeding (3-11).

Post surgical hemorrhage is the major complication of tonsillectomy and potentially life-threatening occurrence. The incidence rate of post-tonsillectomy bleeding that requires surgical control ranges between 5-20% (12). A higher rate of primary bleeding is attributed to the ligation and the cause of secondary bleeding may be believed from sloughing of the superficial eschar from the tonsillar fossa (4,13, 14).

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In the last 20 years, surgeons have become increasingly interested in replacing and augmenting convention sutures by means of adhesive bonds in the closure of surgical wounds. Fibrin glue and tissue adhesive have been used to reduce the incidence of postoperative hemorrhage as they immediately harden by a chain growth polymerization reaction when exposed to tissue fluids. The butyl (Histoacryl) and octyl (Dermabond) have been the most successful derivatives of the polymer, particularly when used in the skin closure and in ear, nose and throat surgery (15).

The question then is, can the post-tonsillectomy bleeding be prevented by tissue adhesive (Histoacryl). This study aimed to evaluate using the N-butyl cyanoacrylate adhesive (Histoacryl) in experimental tonsillectomy through macroscopic and histopathological examination compared to the common used suture ligation.

MATERIAL AND METHODS

The study was carried on 12 apparently healthy dogs of native breed. The animals ranged from 3-12 months of age and weight 5-12Kg. They kept in cages two weeks before experiment for observation and they prophylactically administered wide spectrum anthelmintics, Dectomax in a dose of 0.2mg/kg.B.W. Imizol was injected against babesiosis and anaplasmosis with a dose of 1ml/25kg B.W. The animals fed ad libitum. The animals were classified into two groups of 6 dogs.

Anesthesia and control:

All dogs were subjected to general anesthesia. They were premedicated by acepromazine 0.15mg/kg (Vetranquil 1%, Albrechet, and Aulendorf). Anesthesia was induced by thiopental sodium (Epico) 20mg/kg B.W. 2.5% I/V. Dorsal recumbence

of animals was allowed and the head was extended and fixed to the table.

Procedures:

The oral cavity was widely opened with the aid of mouth gag. The tongue was fully retracted and by the aid of tongue depressor the tonsils were observed. The tonsil was grasped by a tonsil holding forceps and pulled medially. The anterior pillar was incised and by a scissor beginning at the upper pole of the tonsil. The tonsil was bluntly dissected between its capsule and muscular bed until reaching its the lower pole (extra capsular tonsillectomy)

In the first group; the lower pole containing the major blood supply of the tonsil was held by clamps and the tonsil was removed. Ligation of the blood vessels was attempted by 2/0 silk. The tonsil on the other side was also removed by the same methods.

In the second group; the blood vessels were clamped and the tonsils was removed. The Histoacryl vial (B. Braun Petzold GmbH Schwarzenberger Weg Germany) was grasped and inverted where the tip observed filled by the adhesive material. A piece of gauze was held against the wounded area to avoid running off the adhesive material when it is applied. The tip of the vial was removed and then the plastic vial was squeezed for dropping in the wound immediately after removal of the blood vessel clamp. Histoacryl polymerizes and hardens within seconds after application. The piece of gauze was removed and any instrument would keep away from the glued area during the polymerization process. If this was occurred, Histoacryl can remove from instrument by acetone. The other tonsil was removed and Histoacryl was applied.

Aftercare:

Broad-spectrum antibiotics of Enrofloxacin 10%, (El Nasr Pharmaceutical

chemical Co Egypt Abou Zaabal) 2.5mg/kg s/c was used for three days. The animals were daily observed through: the clinical examination (temperature, pulse & respiration), blood oozing from the mouth, examination of the tonsillar fossa and returning to the normal feeding.

The animals were sacrificed; where weekly one animal from each group until the end of the experiment (6 weeks). Tissue specimens were obtained from the tonsillar fossa of animals after scarification of animals. The specimens embedded in paraffin sections and stained by Hematoxylin and Eosin for Histopathological examination.

RESULTS

Duration of operation:

The animals in the first group of suture ligation after tonsillectomies, tolerated an average of 22 minutes procedure. The animals in the second group of Histoacryl application spent an average of 15 minutes procedure.

The clinical examination:

In the first group, the animals were reluctant to feed at the first day and observed difficult food swallowed at the second day. Appetite returned to the normal by the third day post-tonsillectomy. There were un-noticed change in the body temperature while there were increase in both pulse and respiratory rates during 12-24hs. post-operative (Table 1 and Fig. 1). Edema and congestion of the wounded area and surrounding mucous membrane were observed during the first three days post-operative (Fig. 2).

In the second group, the animals returned to the normal appetite in the second day of operation. Daily examination of animals revealed un-noticed change in the body temperature, pulse and respiratory rate (Table 1 & Fig. 1). Mild edema and congestion were observed (Fig.3).

Microscopic picture:

In the first group revitalization of the epithelium, thrombosis, and fibrosis as well as dilated and regenerated capillary vessels with more leukocytes infiltration were apparent after one week of the operation (Fig. 4 & 5). Complete healing and collagen fibrosis were observed after three week of operation (Fig.6).

In the second group, revitalization of the epithelium with mild leucocytic infiltration were observed one week post-operative (Fig.7). Complete healing epithelization of the tonsillar fossa wounds were observed after two weeks of operation (Fig.8). The samples obtained after 6 weeks observed complete maturation of collagen fibers and stratified squamous epithelium mucous membrane (Fig. 9).

DISCUSSION

Tonsillectomy is an effective and safe surgical procedure when the appropriate indications are present. The post-surgical hemorrhage is the major complication of tonsillectomy and potentially life-threatening occurrence. A higher rate of primary bleeding attributed to the ligature and the cause of secondary bleeding may be believed to sloughing of the superficial eschar from the tonsillar fossa. Therefore it leads to increase the interest in replacing the conventional sutures by means of adhesive materials. A tissue adhesive may be defined as a substance that by polymerization will hold tissues together (16). Also it was mentioned that cyanoacrylate injection achieves rapid hemostasis and obliteration of the treated varices (17).

The time of the operation with Histoacryl application was shorter than with the suture ligature. This result was similar to that recorded by (18) who mentioned that N-butyl-cyanoacrylate was superior to the standard suture technique by virtue of its speed, ease and accuracy of application in addition to absence of adverse effects.

Table 1. Change in body temperature, respiratory rates and pulse rates.

DPO	Temp		Resp.		Pulse	
	1 st group	2 nd group	1 st group	2 nd group	1 st group	2 nd group
before	39.02	39.1	18.3	18.3	85.8	79.17
1d	39.45	39.25	40	25.3	144.17	95
2d	39.42	39.15	37.5	23.3	125.8	91.67
3d	39.35	39.1	32.5	22	116.67	84.17
4d	39.2	38.95	23.3	19.67	96.67	80.8
5d	39.13	39.1	19.3	19	89.17	79.17
6d	39.15	38.89	18.5	18.67	85.8	80
7d	39.05	38.97	18.5	18.17	81.67	80
2w	39.03	39.12	18.2	18	85	83
3w	39.05	39.15	17.75	13.5	85	80
4w	38.8	39.15	18	18	81.67	76.67
5w	38.88	39.05	19.5	19	80	72.5
6w	39.12	39.03	18	20	75	65

DPO = days post operative, d= day, W= week,

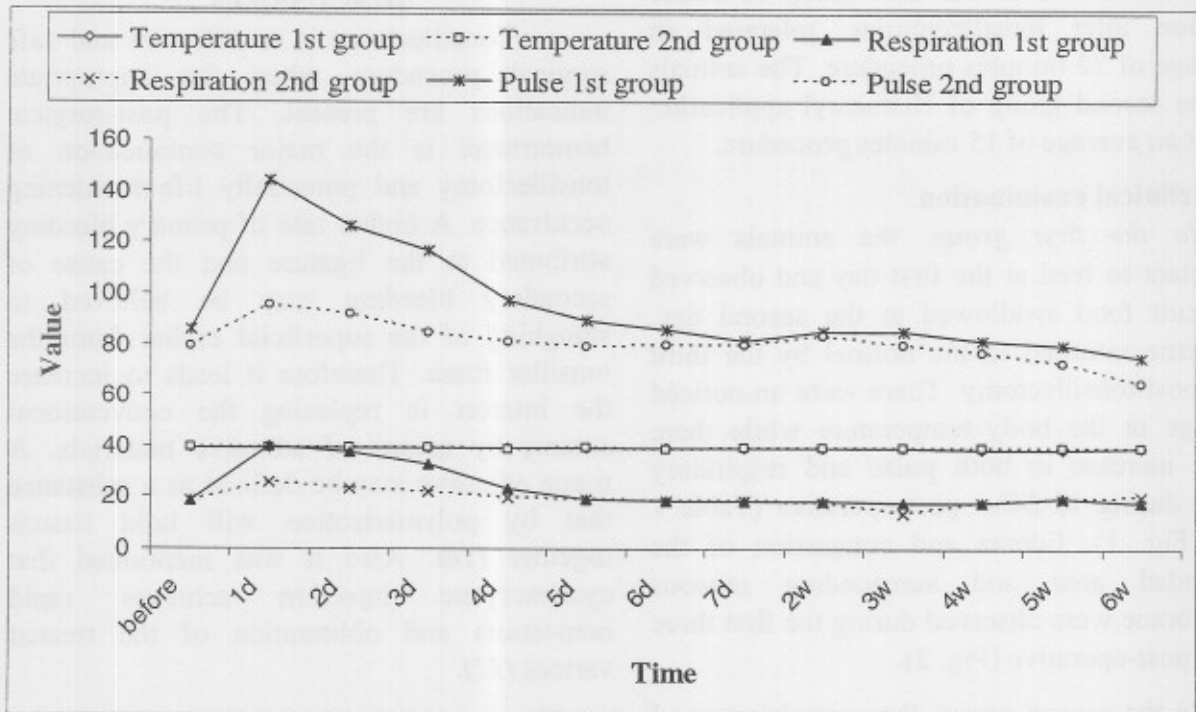


Figure 1. Mean change in body temperature, respiratory rates and pulse rates.



Fig. 2. The macroscopic picture of tonsillar fossa post-tonsillectomy using dissection and suture ligation observing edema and inflammatory reactions.



Fig. 3. The macroscopic picture of tonsillar fossa post-tonsillectomy using dissection and Histoacryl application observing slight edema and mild inflammatory reactions.

Fig. 4. The histopathological examination of specimen taken from the tonsillar fossa, one week post operative of suture ligation group showed revitalized epithelium. **H&E x 300**

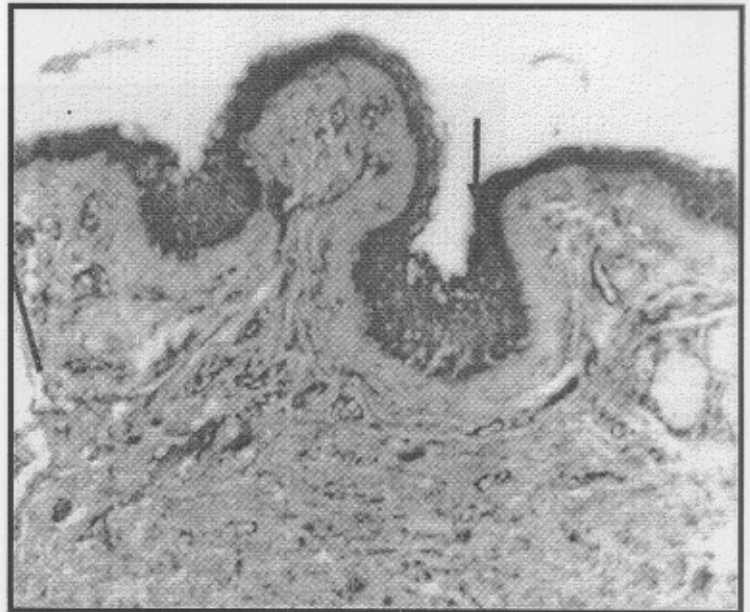


Fig. 5. The histopathological examination of specimen taken from the tonsillar fossa, one week post operative of suture ligation group showed leucocytic infiltration of the submucosa . **H&E x1200**

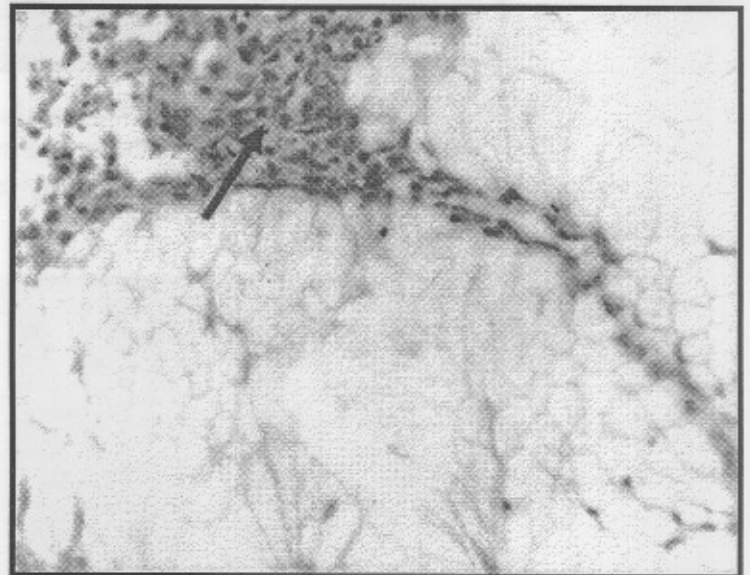


Fig. 6. The histopathological examination of specimen taken from the tonsillar fossa, three weeks post operative of suture ligation group showed complete healing by epithelialization, **H&E x300**

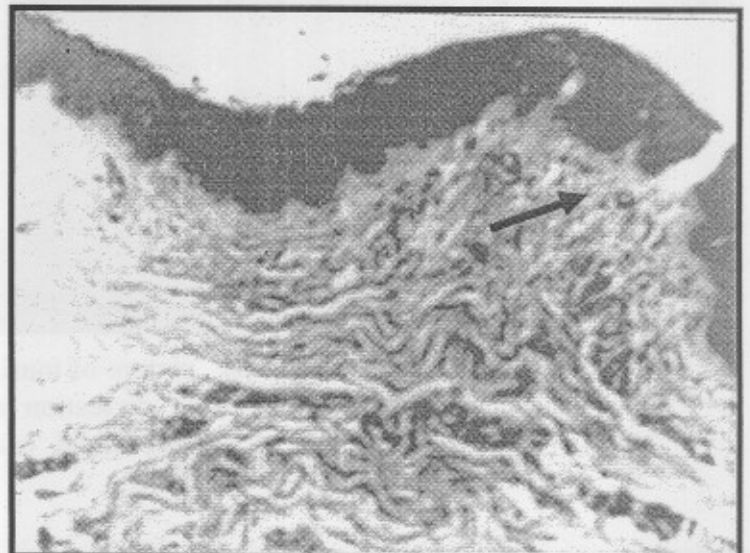


Fig. 7. The histopathological examination of specimen taken from the tonsillar fossa, one week post operative of Histoacryl group showed re-epithelialization and mild inflammatory reaction, H&E x300

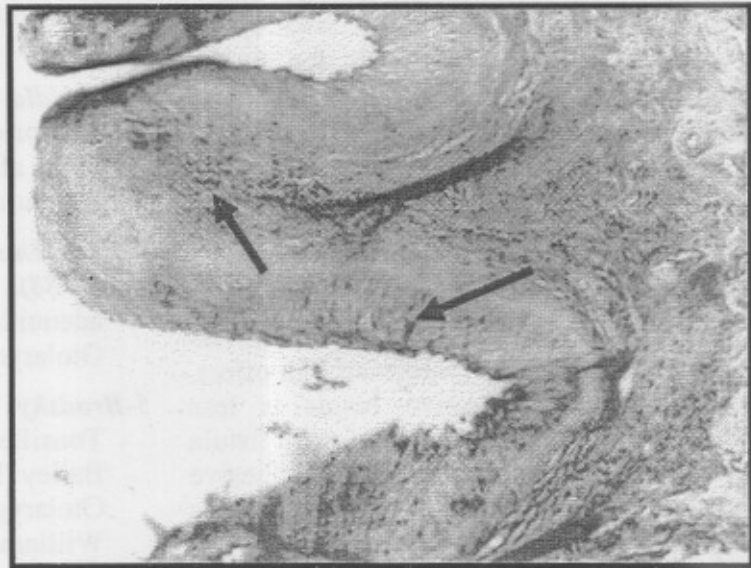
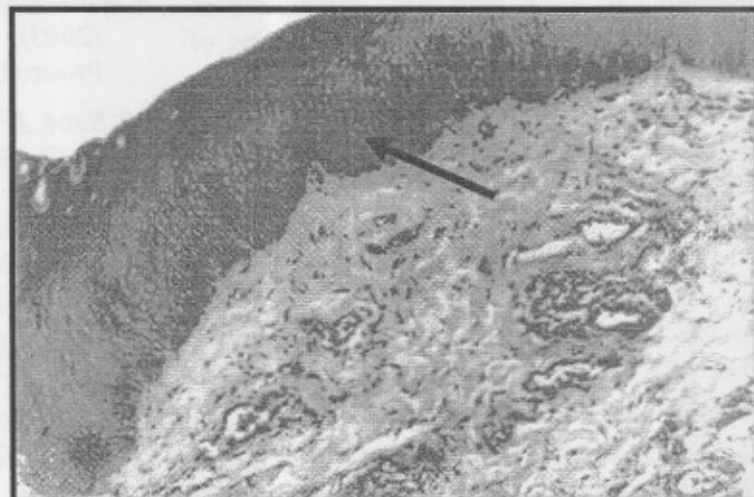


Fig. 8. The histopathological examination of specimen taken from the tonsillar fossa, three week post operative of Histoacryl group showed complete healing by epithelialization, H&E x300



Fig. 9. The histopathological examination of specimen taken from the tonsillar fossa, 6 week post operative of Histoacryl group showed maturation of epithelialization and collagen fibers (normal mucous membrane), H&E x300



Moderate morbidity, difficult swallowing and dysnea in first group were due to the edema observed post the suture ligation. These observations in addition to the postoperative pain and bleeding were recorded in human beings (19, 20). Anorexia of the first day and normal appetite recorded in animals with Histoacryl application may be due to mild edema observed the minimal postoperative pain manifested. The rapid tissue union, no need for sutures removal, antimicrobial effect, the application of adhesive bonds is less painful than suturing and repair of early fistula were the advantages of using the adhesive bonds compared with the conventional sutures in different surgical areas (21-23). Increase in both pulse and respiratory rates post tonsillectomy and suture ligation was in agreement with the results of (24). On the other hand, un-noticed change in temperature, pulse and respiration may be due to the minimal degree of tissue damage and minor pain reflected from application of Histoacryl.

Moderate edema and congested oral mucosa observed in animals of the first group than in animals of the second group may be due to the irritation of suturing and collection of food particles on the suture. Histoacryl forms a layer isolates the healing process from any cause leading to inflammatory response in wounds of the skin (25, 26).

About the microscopical picture in the first group, there were revitalization of the epithelium and more leucocytic infiltration in the first week and nearly complete healing of wounds and collagen fibrosis at the third week. Whereas mild inflammatory reaction and healing completed after two weeks were observed in the second group. These results were in agreement with that reported (27,28).

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المخلص العربي

دراسة مقارنة استخدام الهستواكريل و الربط لنزيف اللوز دراسة تجريبية

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تم عمل هذه الدراسة لتقييم استعمال هيسواكريل بعد استئصال اللوزتين التجريبي كبديل للربط وذلك من خلال الفحص العيني و المجهرى طوال مدة التجربة. تمت هذه التجربة على اثني عشرة كلب تتراوح أعمارهم بين ٣-١٢ شهر وأوزانهم بين ٥-١٢ كيلوجرام. قسمت هذه الحيوانات الى مجموعتين كلاً منهم ستة كلاب- تم إجراء عملية استئصال اللوزتين فى كل كلاب المجموعتين ولكن كان التحكم فى النزيف من استئصال اللوزتين فى المجموعة الأولى عن طريق الربط حول الأوعية التى كانت تغذى اللوز بواسطة الحرير مقاس ٠/٢. أما فى المجموعة الثانية فكان عن طريق وضع قطرات من الهستواكريل على الأوعية المقطوعة. تم متابعة الحيوانات وفحصها إكلينيكيًا يومياً لمدة ستة أسابيع. تم أخذ عينات للفحص الهستوباثولوجى من مكان العملية لمتابعة الالتئام بعد إعدام كلب أسبوعياً من كل مجموعة.

من نتائج الفحص الأكلينيكي ظهر إعياء على كلاب المجموعة التى تم فيه وقف النزيف بالربط حيث امتنعت الكلاب عن الأكل وفقدو الشهية بسبب صعوبة البلع من الالتهابات الناتجة فى مكان العملية بالإضافة الى زيادة معدل النبض والنفس. أما فى كلاب المجموعة الثانية التى تحكمت فيها النزيف بواسطة استخدام الهستواكريل فكان فقدان الشهية طفيف ولم تلاحظ أى تغيرات فى درجة الحرارة أو النبض أو النفس.

وفى المتابعة المجهرية وجد بداية الالتئام مع وجود التهابات فى الأنسجة مع الأسبوع الأول وظهور اكتمال الالتئام ووصول النسيج الليفي حتى مستوى النسيج الطلائى بعد ثلاثة أسابيع من إجراء العملية فى المجموعة الأولى. لكن قلت نسبة الالتهابات بالمقارنة فى المجموعة الثانية مع اكتمال الالتئام بعد أسبوعين من إجراء العملية.

اتضح من هذه الدراسة أن استعمال الهستواكريل كان أفضل من الربط استناداً الى سرعة وسهولة ودقة التطبيق بالإضافة الى فعالية وقف النزيف أثناء العملية وقلة الالتهابات و تقليل حالة الإعياء ما بعد الجراحة. وبهذا يمكن عمل دراسات لتقييم استخدام الهستواكريل فى استئصال اللوزتين فى الإنسان.