

Comparative Evaluation of Suturing Techniques, Skin Staples and Surgical Glue for the Treatment of Auricular Hematoma in Dogs

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Abstract – In the present study the comparative efficacy of conventional suturing technique, Skin Staples and Surgical Glue for treatment of auricular haematoma were evaluated in fifteen adult dogs. These dogs were divided into 3 groups (A, B and C) each consist of five dogs. All the dogs in each group were sedated by using Xylazine HCL (Xylaz, Farvet) at 0.1-0.5 mg/kg I/M and Ketamine HCL (Ketarole) at 4.4 mg/kg I/M for maintaining anesthesia was used. In group A, Auricular haematoma was treated with conventional suturing technique. In group B, Skin staples were applied for treatment. While Dogs of group C, were treated with Surgical Glue. Closure Time, Cosmetic appearance and Healing Time were evaluated. Time for closure of skin incision was significantly less in animals who had treated with surgical glue as compared to conventional suturing technique and Skin staples. Cosmetic appearance grading were significantly different among all three groups. There were also significant differences in healing time among all groups. Surgical Glue is the most favourable and effective technique for the closure of skin incision for repairing of skin of pinna of ear as compared to skin staples and Silk suture.

Keywords – Auricular Haematoma, Dogs, Conventional Suturing Technique, Skin Staples and Surgical Glue.

I. INTRODUCTION

Over the last twenty years, there has been tremendous progress in the affiliation and care of people towards pet care especially dogs and cats. People want their pets healthy and active. Now the owners of canines and felines demand more advance care for their pets for the treatment of illness and other problems which disturb or impair the beauty of their pet. Auricular hematoma in dogs is very concerning for the pets and for their owner.

Aural haematoma is an accumulation of blood in between skin and cartilage of the ear, it usually appear as fluid filled swelling on the concave surface of Pinna. In most cases, Aural haematoma occurs due to constant shaking and rubbing of ear due to otitis, ectoparasitism, otorrhoea, foreign bodies, hypersensitivity and allergic dermatitis [1].

Aural haematoma are well documented in dogs, sporadic cases have been recorded in sheep, buffalo calves and goats. The aural hematoma is frequently painful due to the pressure that is generated by amassed blood, and it prevents the tissue from remaining in apposition. Hematomas formation can arise quickly but initially are soft however with the passage of time fibrosis can make it thickened and firm. The symptoms of an aural hematoma appear on ventral side of pinna [2].

Many diagnostic tools and techniques are used for the repairing of skin incision such as suturing methods, skin staples and surgical glue. Another surgical procedure to treat this conditions opening by surgery and finishing by the pin sutures [3] and its combination with a squeezing sponge [4].

In surgical suturing technique of treating Aural Haematoma, the full length longitudinal incision is given on haematoma and horizontal interrupted mattress sutures are placed parallel to the incision. The sutures might be detached nine to ten days after surgery and bandage should remain intact for seven days [5].

Study on skin staples begin in 1984 [6]. Surgical staples are made up of stainless steel. A skin stapler is used for the application purpose of staples. There are number of advantages of applying skin staples over the skin incision for closure e.g. it needs less time in application [7] increases the blood flow towards the site of incision which facilitates the process of wound healing [8], lowers the chances of reoccurrence of infection [9], it is cost effective in case of uncomplicated cases [10] and it is consider more favorable choice for surgeons as it is faster in its use or application [11].

The tissue adhesives are liquid monomer that polymerize on contact with tissue surface in an exothermic reaction and creates very strong and flexible film that bonds the apposed edges [12]. Skin adhesives 9 Cyanoacrylate were discovered in 1949 [13]. There are number of merits or advantages of skin adhesive or surgical glue e.g. it is simple to apply, it proves very fast closure of incision, painless in applying, results in good cosmeses, it is needle less so no needle stick injuries [14], reduces the rate of infection [15].

II. MATERIALS AND METHODS

Dog Selection

For this study total fifteen adult dogs as and when presented at Pet Centre, University of Veterinary & Animal Sciences Lahore, Surgery clinic of UVAS main campus and pet clinic of UVAS, Ravi Campus having Auricular haematoma irrespective of breed, sex and considering almost similar age group, both stray and domesticated were selected.

Experimental Design

Deworming and vaccination of the dogs along with complete clinical examination was done, and prior to initiation of study their temperature, heart rate, respiratory

rate, capillary refill time, and general body condition was thoroughly checked. The dogs were divided in three groups A, B and C. Specific tagged collars were applied on all the dogs. They all were kept under comfortable environment and on a standard commercially available dog feed diet with ad libitum access to water. All the dogs of three groups, having Auricular Haematoma were treated with 3 separate techniques for comparison. In group A, Auricular haematoma was treated with conventional suturing technique. In group B, Skin staples were applied for treatment. While Dogs of group C, were treated with surgical glue. Thus comparative efficacy of individual techniques in their respective cases was evaluated.

All the dogs in each group, were sedated by using Xylazine HCL (Xylaz, Farvet) at 0.1-0.5 mg/kg I/M and Ketamine HCL (Ketarole) at 4.4 mg/kg I/M for maintaining anesthesia was used.

All the dogs were given a bath and the surgical site was properly prepared by shaving 24 hours prior to surgery. The dogs were brought into operation room after cleaning properly. They were placed on the table in lateral recumbence and affected ear showing upwards., the auricular haematoma was treated by Incisional technique. In this technique, after giving preanesthaics and maintaining general anesthesia, longitudinal incision was given on the length of the hematoma on the concave surface of pinna of ear, only comprise the skin but avoiding the cartilage. Blood was drained and fibrin clots were removed from the cavity of haematoma by using a moistened gauze sponge or mosquito forceps. The cavity was flushed by using sterile saline. Then we applied sutures by using absorbable silk (TRUSILK-1) in dogs of group A, extended through the skin (0.75 to 1 cm) on the incision, attaching the skin to the underlying cartilage. And we applied skin staples (+ ADVAN) over the incision for closure of skin in group B while surgical glue was infiltrated in the cavity with the help of nozzle of surgical glue bottle.



Fig. 3.3 Horizontal Matters suture applied on pinna of ear



Fig. 3.7. Skin Staples applied over the incision on pinna of ear in dogs



Figure. 3.9. Application of Surgical Skin glue

The following parameters include Closure Time, Cosmetic appearance and Healing Time was evaluated.

The data that was obtained analyzed by using Analysis of Variance (ANOVA) for application time, Chi-square for cosmetic appearance and repeated measure design ANOVA for healing time with significance $P < 0.05$ by using Statistical Package for Social Science (SPSS) version 15.0.

III. RESULTS

Time was noted in seconds with the help of stop watch for application of suture material, skin staples and surgical glue. Time was recorded from the time of starting to complete closure of incision. Statistical analysis indicated a significant difference ($p < 0.05$) for application time. Group A had a mean of 146.5 ± 20.08731 , group B with a mean of 61.5 ± 2.25832 and in case of Group C mean was 49.1667 ± 4.44597 (Table-4.1). This parameter's study showed that surgical glue was the fastest to apply for closure of skin incision over the pinna of ear.

Table 4.1. Time of closure with mean value and standard deviation of all groups.

Groups	Number of samples	Mean	Std. Deviation \pm
Group A	5	146.5000	20.08731
Group B	5	61.5000	2.25832
Group C	5	49.1667	4.44597

Group A: Silk Suture.

Group B: Skin Stapler.

Group C: Surgical Glue.

Cosmetic appearance was evaluated on a 1-5 point visual analog scale, where 1 represented poor, 2 – fair, 3- good, 4- very good and 5 showed excellent out come. Statistical analysis revealed that all the techniques were not dependent on one another ($p < 0.05$). Group C showed the best cosmetic appearance as compared to other two groups. Excellent

result was only seen in group C (33%) while cosmetic appearance falling in very good category seen in group A (33.3%), group B (50%) and group C (66.7%). Good category cosmoses was highest in group A (66.7%) as compared to group B (33.3%) and Group C (16.7%).

Table 4.2. Percentages of visual point scale among all the groups.

Visual Point Scale	Group A		Group B		Group C	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1						
2						
3	4	66.7 %	2	33.3 %	1	16.7 %
4	2	33.3 %	4	66.7 %	3	50.0 %
5					2	33.3 %

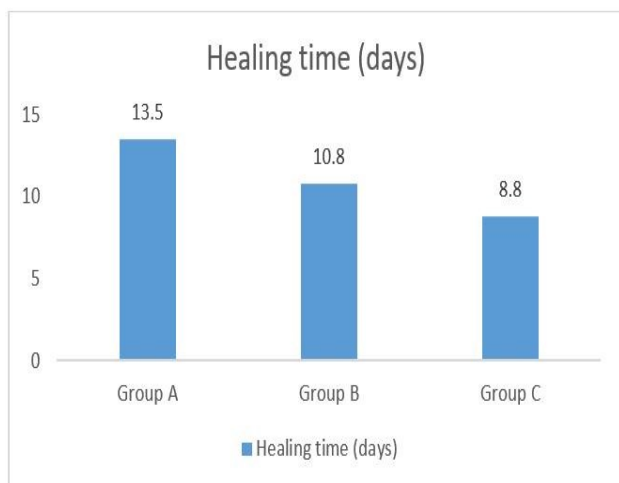
1 = Poor 2 = Fair 3 = Good 4 = Very Good 5 = Excellent

The dogs were inspected after surgeries on 7th, 10th, 15th and 20th days for the evaluation of healing time. Evaluation was done on the basis of mean value of healing days. Statistical analysis indicated significant difference ($p < 0.05$) with respect to healing time. Mean values were 13.5 ± 1.22474 , 10.83 ± 0.75277 and 8.83 ± 0.75277 for group A, group B and group C respectively. Group C showed the best healing time as compared to other two groups. (Table-3).

Table 4.3. Healing time with Mean Value and Standard deviation of all groups.

Groups	Number of samples	Mean	Standard Deviation \pm
Group A	5	13.5000	1.22474
Group B	5	10.8333	0.75277
Group C	5	8.8333	0.75277

Group A: Silk Suture, **Group B:** Skin Staples, **Group C:** Surgical glue



Group A: Silk Suture, **Group B:** Skin Staples, **Group C:** Surgical glue

IV. DISCUSSION

Aural haematoma in canines had been recorded as eighth most common surgical procedure in canines graded only lower ovario-hysterectomy, castration, declawing, dental prophylaxis, tooth extraction, abscess treatment and removal of cutaneous neoplasia in a survey conducted with North American practitioners [16]. Aural haematoma was the maximum common physical damage of the pinna observed on the concave surface of ear which is self-incited by scratching and head shaking [17]. Drainage of haematoma by disposable teat tube [18] and Penrose tube [19], Close suction drainage [20], drainage and glucocorticoid instillation [21].

The study was conducted to compare the efficacy of conventional suturing, skin staples and surgical glue for the apposition of skin incision for the treatment of auricular hematoma in dogs. Evaluation was done for these techniques on the basis of application time required for closure of incision, healing time and cosmetic outcomes. Time of closure was recorded in seconds while healing was in days and cosmetic appearance was evaluated on visual point analog scale reading ranging from 1 to 5.

The experiment was conducted on fifteen cases of auricular hematoma in dogs presented at the Clinical Medicine and Surgery department of University of Veterinary and Animal Science, Lahore. The dogs were divided into three groups, i.e. A, B and C. Each group comprised of five dogs. Horizontal Matters Suture pattern was applied in dogs of group A, Skin Staples using skin stapler were applied in case of group B and Surgical Glue (Adhesive) was applied in case of group C for the closure of skin incision on pinna of ear in dogs.

Time of closure in all groups was calculated at the point to starting of suture, application of skin staples and surgical glue to complete closure of wound. To note the closure time, a stop watch was used for this purpose. When the time was noted, it was found that the time of closure was different in all three groups using different techniques.

Surgical glue technique showed a lesser time of closure as compared to skin staples technique and suturing technique with a mean value of 49.1667 ± 4.44597 , 61.5 ± 2.25832 and 146.5 ± 0.8731 respectively. A comparison between tissue adhesive (surgical glue) and subcuticular suture for closure of surgical incision was performed to measure the time efficacy, cosmesis and wound healing. Study was done on 59 patients. Glue was used in 26 patients and suture was used in 33 patients. Results achieved were that time taken and cosmesis were both techniques and no major wound complication was observed [22]. Conventional suturing was compared with tissue adhesive for closure of skin of 62 patients and they were divided in two groups, 32 in one group and 30 in other group. The objective of the study was to get idea about the pain difference of the two methods. On fifth day, patients were examined and the results presented that patients in which tissue adhesive was used were much comfortable while micturition, walking, defecating and there was no difference in pain while lying or sitting [23].

All the dogs were examined on the 21th days after surgeries for the evaluation of cosmetic appearance on the basis of point visual analog scale 1 to 5, where 1 showed the worst outcome while 5 represented the excellent results. Group C showed the best cosmetic outcomes as compared to rest of the groups. Excellent outcome was only seen in group C (33.3%) while cosmetic appearance coming into very good category were seen in group A (33.3%), Group B (66.7%) and Group C (50%). Good category cosmesis was highest in Group A (66.7%) as compared to Group B (33.3%) and Group C (16.7%). Statistical analysis showed that all the techniques were independent of each other (P value >0.05) and revealed that there is no relationship between all the techniques and cosmetic appearance. (P value > 0.05).

Skin staples and two types of sutures were compared for closure of linear abdominal incision in a study. The examination of wound was done for thirty days. The main closure time in case of suture was almost 4.2 cm per minute while it was 22.5 cm in case where staplers were used. The cosmesis was same almost. Staples were a bit painful while in time of removal but it had an advantage of time saving and could be resulted until empty [24].

In this study for the evaluation of healing time, the dogs were inspected at 7th, 10th, 15th and 20th days of postoperative care proper healing was considered at the time when proper apposition of wound edges took place. The dogs were regularly checked and observed to calculate the healing time and evaluation of healing time was counted in days using mean value of healing time. Statistical analysis expressed a significant difference between groups with respect to healing time (p value <0.05). Mean values of healing time was 13.5 ± 1.22474 for group A, Group B showed mean value of healing time 10.83 ± 0.75277 while Group C revealed the best mean value of healing time with value of 8.83 ± 0.75277 .

In another experiment, a comparison between skin adhesive and percutaneous absorbable sutures was conducted for closure of surgical wound. The Sample size was 100. The skin adhesive was used in 50 and in other 50,

sutures were used. Evaluation was mainly done on the basis of wound dehiscence and cosmetic appearance. Results obtained showed that the rate of wound dehiscence was greater in case of skin adhesive and the cosmetic appearance was also better in case of suture group [25].

V. CONCLUSIONS

The results obtained in the present study shows that the skin adhesive (Surgical Glue) is the most favorable and effective technique for the closure of skin incision for repairing of skin of pinna of ear as compared to skin staples and Silk suture. The healing time of surgical glue was far better than the other two techniques because surgical glue has bactericidal properties and it provides a water proof closure of wound edges. So there are minimum complications due these properties in case of surgical glue usage. Surgical glue also exhibited the best cosmetic outcome with minimal scar formation. It was also found that the erection of ear pinna after surgery in case of auricular hematoma was much better by using surgical glue as compared to skin staples and sutures technique. However there are some limitations of usage of surgical glue here in Pakistan e.g. it is not easily available in Pakistan and it is very costly.

REFERENCES

- [1] Ahiwar V, Chandrapuria VP, Bhargava MK, Swami M, Shahi A, Jawre S. 2007. A comparative study on the surgical management of canine aural haematoma. *Indian J. Vet. Surg.* 28, p 98–100.
- [2] Brow C. 2010. Surgical management of canine aural hematoma. *Lab. Anim.* p 14-105. [3] David T., Kasper, I. and Kasper, M. (2000): *Atlas der Kleintierchirurgie*. 2nd edition. Schlutersche Hanover. p 213.
- [4] Lanz OI, Wood BC. (2004): *Surgery of the ear and pinna*. *Vet. Clinic. North Am. Small Anim. Pract.* pp 567–599.
- [5] Mohsin AJ F.2010. Surgical treatment of ear haematoma in dogs. *Bas. J. Vet. Res.* 9, pp 65–70.
- [6] Orlinsky M, Goldberg RM, Chan L, Puertos A, Slajer HL. 1995. Cost analysis of stapling versus suturing for skin closure. *Am J Emerg Med.* 13(1):77-81.
- [7] Chughtai T, Chen LQ, Salasidis G, Nguyen D, Tchervenkov C, Morin JF. 2002. Clips versus Sutures technique: is there difference? *Can J Cardiol.* 16:1403-7.
- [8] Graham DA, Jeffery JA, Bain D, Davis P, Bentley G. 2000. Staples versus subcutaneous vicryl Skin closure in knee replacement surgery: a spectro photographic assessment of wound Characteristics. *Knee.* 7:239-43.
- [9] Selvadurai D, Wildin C, Treharne G, Choksy SA, Heywood MM, Nicholson ML. 1977. Randomized trial of subcuticular suture versus metal clips for wound closure after Thyroid and parathyroid surgery. *Ann R Coll Surg Engl.* 79(4): 303-306.
- [10] Khan AN, Dayan PS, Miller S, Rosen M, Rubin DH. 2002. Cosmetic outcome of scalp wound closure with staples in pediatric emergency department: a postoperative randomized trial *Pediatric Emerg Care.* 18: 171-173.
- [11] Murphy M, Prendergast P, Rice J. 2004. Comparison of clips versus sutures in orthopedic wound closure. *Eur J orthop Surg Traumatol.* 14(1) 16-18.
- [12] Chen K, Klapper AS, Voige H, Priore GD. 2010. A randomized, controlled study comparing two Standardized closure methods of laparoscopic port. *Sites JSLS.* 14:391-394.
- [13] Shivamurthy DM, Singh S, Reddy S. 2010. Comparison of octyl-2-cyanoacrylate and conventional sutures in facial skin closure. *Natl J Maxillofacial Surg.* 1(1): 15-19.
- [14] Singer AJ, Quinn JV, Hollander JE, Clark RE. 2002. Closure of

- laceration and incisions with octylcyanoacrylate: a multicenter randomizes control trial. *Surgery*.131:270-276.
- [15] Blondeel P, Murphy JW, Debrosse D, Nix JC 3rd, Puls LE, Theodore N, Coulthard P. 2004. Closure of long surgical incisions with a new formulation of 2-octylcyanoacrylate Tissue adhesive versus commercially available methods. *Am J Surg*.188 (3): 307-313.
- [16] Johnson KS, Schulz Seim HB, Willard MDA, Bahr A, Carroll GL. 2007. Aural Hematomas and Traumatic of the Pinna, In *Textbook of Small Animal Surgery 3rd Edition: Theresa Welch Fossum: Elsevier science, Moresby Inc. Publishers.* 307- 312.
- [17] Henderson R.A. and Horne, R. (2002) Pinna. In *Textbook of small animal surgery 3rd edition. Eds., Slatter Douglas: Saunders W.B. Publishers,* pp 1737-1740.
- [18] Wilson JW. 1983. Treatment of auricular hematoma, using a teat tube. *J. Am. Vet. Med. Assoc.* pp1081–1083.
- [19] Joyce J. A. (1994) Treatment of canine aural haematoma using an indwelling drain and corticosteroids. *Journal of Small Animal Practice,* pp 341 – 344.
- [20] Swaim S. F. and Bradley, D. M. 1996. Evaluation of closed-suction drainage for treating auricular hematomas. *J. Am. Anim. Hosp. Assoc.* pp 36–43.
- [21] Kuwahara J.1986.Canine and feline aural hematoma: clinical, experimental, and clinic pathologic observations. *Am. J. Vet. Res,* pp2300–2308.
- [22] Nagpal BBM, VSM, Kumar MG, Nagi MG, Singh WCP. 2004. Suture less closure of operative skin wounds. *MJAFI*.60:131-133
- [23] Bowen ML, Selinger M. 2002. Episiotomy closure comparing enbucrilate tissue adhesive with Conventional sutures. *Int J Gynaecol Obstet*.78:201-205.
- [24] Gaat D, Quick CR, Owen S. 1985. Staples for wound closure: a controlled trial. *Ann R Coll Surg Engl.* 67(5): 318-320.
- [25] Ven den Ende ED, Vriens PWHE, Allema JH, Bresulau PJ. 2004. Adhesive bonds or percutaneous absorbable suture for closure of surgical wounds in children. Results of a prospective randomized trial. *J pediatric surg.* 39: 124.