APPLICATION OF SILICONE IMPLANTS
IN RECONSTRUCTIVE SURGERY IN DOGS.
CASE STUDIES

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Abstract

The aim of the study was to evaluate silicone implants for the treatment of ear and scrotal defects in dogs. Reconstructive surgery using silicone implants was performed in four dogs. Two of the cases presented are concerned with the application of a hard, medical grade, silicone as an implant to correct positional and erectile defects of the ear pinna. The next two cases present the issues of the deferred implantation of the silicone prosthesis as opposed to simultaneous implantation with castration. In all cases, no major complications were noted. The authors discuss the case and indicate a need for corrective/cosmetic surgeries in dogs, and show the type of medical problems related to such procedures. According to the authors, the implantation of the prosthesis at the time of castration increases the chance of a successful surgery. In cases where the placement of the implants is going to be postponed until after the castration, the need for preparatory surgery for the implants’ bed, using expanders, should be taken into account. In the case of bacterial infection, treatment is more successful after the removal of implants.

Key words: dog, silicone implants, reconstructive surgery.

Plastic and reconstructive surgery in veterinary medicine is a new specialty developing in small animal practice. Treatment procedures are performed when there is a need for tissue reconstruction, or for cosmetic purposes. Functionality and proper appearance after the treatment, injury, or birth defect, are the main objectives. Medical silicone is commonly used for such purposes. It is a silicone-organic composition, consisting mostly of carbon and silicone atoms, creating dimethylsiloxane chains of different lengths. Medical silicone is highly biocompatible with the vertebrate’s tissue, and is non-toxic, non-allergic, and resistant to biodegradation (16). The reaction of the tissue to silicone is mostly limited to the formation of a connective tissue sac around the implant (12, 16). The types of silicone used in medicine are purified to remove any contaminants, and are marked as Medical Grade, i.e., permitted for use in medicine. The applications of medical silicone include implants used in plastic surgery, implants replacing missing anatomical body parts, and, since the 1980s, as tissue expanders and silicone dressing in scar treatment (3, 4, 6, 10, 17). In addition to plastic surgery, silicone is widely used in other fields of medicine, such as cardio-surgery (artificial valves, heart pacemakers) (8), orthopaedics (artificial joints, tendon sheaths) (1), child neurosurgery (valves in hydrocephalus treatment) (9), and ophthalmology (2).

In veterinary practice, animals suffering from birth defects, mechanical injuries, or diseases causing the permanent deformation of soft or skeletal tissues, may be regarded by owners as disabled and less valuable. Consequently, many of them seek medical solutions for their pets. Plastic surgery can help achieve the desired results in such cases. The use of in animals up until now was conducted for the purpose of pre-clinical studies in human medicine, and now animals are the direct beneficiaries of this research. It should be noted that every year there is an increased number of reconstructive surgeries performed on animals with the use of silicone implants. The reports focus largely on silicone prosthetic eyes in dogs and horses (14) after enucleation. A few have been reported on the use of silicone implants. The reports focus largely on silicone prosthetic eyes in dogs and horses (14) after enucleation. A few have been reported on the use of silicone implants. The reports focus largely on silicone prosthetic eyes in dogs and horses (14) after enucleation. A few have been reported on the use of silicone implants. The reports focus largely on silicone prosthetic eyes in dogs and horses (14) after enucleation.
the nature of the related medical problems. The four clinical cases presented in this paper demonstrate the need for plastic surgery in dogs, and they emphasise the nature of the related medical problems.

Material and Methods

To illustrate the application of silicone implants, four out of the 15 cases in 2008 were selected for the presentation. The qualifications for the operation included a general physical examination, and CBC and chemistry screening to rule out the presence of any clinical or subclinical inflammatory processes at the time of surgery. The health status of the animals was good, and there were no evidence of diseases that could potentially influence the outcome. (WBC <10,000, the tissue in the planned surgical site showed no evidence of any inflammation).

Patient No. 1

A 3-year-old, intact male German Shepherd with a history of a two-month-old bite wound injury to the right ear resulting in cellulites and the irreversible deformation of the ear pinna (Fig. 1). On presentation, the wound had healed and the scar was stable. Strong shrinking of the scar caused the central auricular cartilage to bend and severely deform the ear pinna. The objective of the surgical procedure was to eliminate the deficit in the ear mobility, and to restore the proper position of the auricle. The surgery was performed under general inhalation anaesthesia. The scar limiting the movement was removed and the auricular cartilage was reconstructed. After mobilising the soft tissues in the surrounding area, a proper bed was created for the implantation of the silicone sheeting in the place of the removed scar. The silicone implant used for the reconstruction was in the form of strips with a smooth surface, cut from a Nagosil block for cutting (hard type), made by Nagor (GB). The implant at the base of the ear pinna was inserted under the caudoauricular muscles and attached to the auricular cartilage and perichondrium of the auricle in a simple interrupted pattern, using non-absorbable Polypropylene PP 4/0 (YAVO, Poland) (Fig. 2).

The bed was closed densely surrounding the implant, using the same suture material. The skin of the auricle was apposed in a simple continuous pattern, using Nylon PA 2/0 (YAVO, Poland). The skin sutures were removed after 10 d. During the post-surgical period, 15 mg/kg b.w. of amoxicillin (Synulox, Pfizer Animal Health, USA) was administered subcutaneously twice daily for 5 d.

Patient No. 2

A 1.5-year-old, intact male Bull Terrier was presented with a distorted left ear caused by a weakness of the auricular cartilage (Fig. 3). As a result, the vertical setting of the ear pinna, as well as the anatomically correct positioning of the ear was not possible. Surgery was performed under general inhalation anaesthesia. The auricular cartilage was strengthened by implanting a thin strip of silicone, resulting in the proper stiffness of the ear. The additional use of sutures between the scutum of the auricular cartilage and the base of the auricle improved the foundation of the ear. In this case, the surgical technique, suture materials, and postoperative care were similar to that of patient No. 1.

Patient No. 3

A 3-year-old, intact male German Shepherd was presented to the local clinic post-bite, with acute inflammation of the left testicle and scrotum as shown in Fig. 4. He was treated subcutaneously, twice daily for 7 d with 15 mg/kg b.w. of amoxicillin (Synulox, Pfizer Animal Health, USA), along with subcutaneous injection of 0.2 mg/kg b.w./d of meloxicam (Metacam, Boehringer Ingelheim - D). In spite of the treatment, the pain, the edema of the scrotal sac and the exudation continued to warrant the ablation of the scrotum. The owner agreed to castration surgery, but requested an implant in place of the removed testicle. The bacterial culture of the scrotal sac exudates was negative. The surgery was performed under inhalation anaesthesia via a ventral midline incision at the base of the scrotum. The skin, subcutaneous tissue, and the spermatic fascia were incised, the testis exteriorised, then the parietal vaginal tunic was incised, and the vaginal process and cremaster amputated. The testicular artery and vein, and the ductus deferens, were ligated and severed. Then, the testicular implant was placed in the lumen of the vaginal tunic.

The testicular implant used for this procedure (Nagor RGID-2 medium type, UK) was 34x39 mm in size, filled with hydro gel with a smooth external surface. The vaginal tunic was closed with Catgutt Chromic 5-0 (Ethicon, USA) in a simple interrupted pattern, and the implant was moved into the scrotum.

The second testicle was removed via an additional, contralateral incision in the spermatic fascia, made in the same manner, and the silicone prosthesis was implanted in the way described above. To prevent the cranial shifting of the implants within the subcutaneous tissue, and to keep the two testicular implants separated, the subcutaneous space was closed with two simple stitches using absorbable Dexon 2-0. The two implants remained naturally separated by the scrotal septum.

The scrotal incision was closed in a single interrupted pattern with a non-absorbable Nylon PA 2/0 (YAVO, Poland). The skin sutures were removed after 10 d. Postoperatively, 15 mg/kg b.w. of amoxicillin (Synulox, Pfizer Animal Health USA) was administered subcutaneously twice daily for 5 d.

Patient No. 4

A 5-year-old, male Dachshund, presented with a history of unilateral orchietomy 12 months prior, because of suspected neoplasia. The owner requested a testicular implant to improve the dog’s cosmetic appearance. The physical examination revealed a healed postoperative wound on the left side of the scrotum, with partial atrophy and collapse of the scrotal sac. To create a space for the implant, the dog was placed under general inhalation anaesthesia (Fig. 5). Because of the lack of a vaginal tunic, a pouch to fit the implant was surgically dissected between the scrotal skin and the subcutaneous fascia. The testicular implant was produced by Nagor TGID-1 (UK), with dimensions of
26x31 mm, to approximate a near perfect anatomical appearance. The implant was placed in the formed sac, and the incision was closed in two layers: the subcutis in a simple interrupted pattern using non-absorbable Polypropylene PP 4/0 (YAVO, Poland), and the skin in a simple interrupted pattern using Nylon 2/0 (YAVO, Poland). Because the surgical preparation of the sac traumatised the tissue, we expected a degree of oedema and inflammation afterwards. To decrease it, the dog was treated for 5 d with subcutaneous injections of 0.2 mg/kg/d of dexamethasone (Dexasone, ScanVet, Poland). The skin sutures were removed after 10 d.

Results

In cases 1 and 2, the postoperative period was uneventful. There was no swelling, haematoma or excessive exudates from the postoperative incisions. According to the owners, the dogs were not interested in the postoperative sites. In dog No. 1, in the first week after surgery, the hypermobility of both ears was observed, which could be explained by possible temporary pruritus, or by a sensation related to the new position of the ears. However, the dog did not try to scratch or excessively rub the ears. In both cases, 10 d after the surgery, the incisions were completely healed and the sutures were removed. Both dogs did not show any sensitivity or discomfort during the routine examination, which included palpation of the ears. The silicone implants could be palpated under the skin, and the surrounding tissue was not swollen. Two years after the surgery, both dogs showed correct position of the ears, and there was no evidence of any adverse reaction (Figs 6 and 7).

Dog No. 3 had periodic health checks for the next 2 years at a local veterinary clinic and the post surgical results were excellent (Fig. 8).

The wound in the scrotal sac healed within 10 d. In spite of the surgical procedure being performed on significantly compromised tissue, the implant was well tolerated without any adverse reactions such as inflammation, swelling, or infection. Both implants adequately filled the space of the scrotal sac, and could be manually moved without causing discomfort, imitating normal testicles.

In the case of patient No. 4, the incision healed uneventfully; however, the skin covering the implant appeared to be thinner and tense, more so than in previous cases. The implant had limited mobility and palpation caused the dog visible discomfort. During the 3-year postoperative period, the owner reported excessive interest and licking of the scrotum, which caused local swelling, inflammation, and maceration of the scrotal skin. During that time, the dog was prescribed topical treatment in the form of Panalog ointment (Novartis), to be applied twice daily for 10 d, which temporarily decreased the inflammation, which reoccurred shortly after the treatment was discontinued. This indicated the possible failure and rejection of the implant. After approximately 5 years, the dog was presented with symptoms of severe inflammation, necrosis, and dehiscence of the right scrotum, partially exposing the testicular implant (Fig. 9).

To prevent infection and to preserve the healthy right testicle, the implant was surgically removed and the surrounding tissue cleansed. The wound was allowed to heal by the secondary intention healing process (Fig. 10).

The macroscopic appearance of the removed implant was normal. Further tests by the manufacturer proved it to be free of structural defects.
Fig. 3. Patient no. 2, before surgery, note position of the ears.

Fig. 4 A. Testicular vaginal tunic. B. Silicone testicular prosthesis.

Fig. 5. Placement of the silicone implant into the pouch dissected in subcutaneous tissue.

Figs 6 and 7. Positioning of both ears after silicone implants were placed.
Discussion

Surgical treatments with the use of silicone implants are uncommon in everyday veterinary practice. There is also a lack of reports from clinical studies about prosthetics for the ears, as well as silicone testicular implants.

Medical advances in veterinary medicine force practitioners to face up to new challenges. The surgical procedures used in the cases mentioned above should be categorised as moderately invasive. They are not particularly demanding regarding equipment or surgical skills. Nevertheless, faulty antisepsis, unreliable anchoring of the implant, insufficient coverage of the implant with well-vascularised tissue, as well as inadequate postoperative wound care may result in failure. Each candidate for surgery should be carefully selected and close attention should be paid to the type and size of the selected implant. It is critical to adequately imbed and properly cover the implant with viable and minimally traumatised tissue. Our modest experience made us aware of the absolute necessity of using delicate surgical techniques, which allow for the proper perfusion of blood in the tissue surrounding the implant. A bed for the implant cannot be too small because this might cause implant deformation and excessive tension resulting in tissue ischaemia. On the other hand, too large a space could allow excessive movement, which may cause a haematoma. The routine placement of wound drainage should be considered, as it has been successfully used in other cases not mentioned here, due to the short post-operative observation period. The presence of the drain for longer than 24 h, or lack of continuous care by the owner, may cause problems such as drain removal by the dog, or infection. Based on the observation of case No. 4, where the main aetiological factor was a delayed placement of the implant, we have been led to believe that the absence of the vaginal tunic decreases the chances of a successful implantation of the silicone prosthesis.

A possible explanation for the infection and implant failure could be attributed to the characteristic build (short limbs) of the dog, predisposing it to more frequent chaffing of the scrotal sac. In addition, the lack of the vaginal tunic created an imperfect anatomical condition in the implantation bed. In the case of dog No. 3, the direct placement of the implant in the subcutaneous tissue did not create an environment favourable to the retention of the implant, which caused adverse reactions such as the licking and rubbing of the scrotum as in dog No. 4.

In the authors’ opinion, orchiectomy with the simultaneous placement of implants allows for the increased tolerance of the silicone prosthesis, and prevents inflammation due to self-inflicted trauma of the scrotum.

The retrospective analysis of the patient in case No. 4, revealed the possibility of a pre-existing sub-clinical infection (11, 15).

The results based on the observation of our own cases, are different from those published by the authors.
of US patent #58-68140, on the webpage www.nuticles.com, describing the same tolerance of implants regardless of the site of the implantation (in the vaginal tunic, or subcutaneous tissue).

To minimise the risk of failure, it is worth considering the use of 10% povidon-iodine solution for bacterial decontamination of the surgical site, flushing of the implant bed to prevent tissue contracture (5), as well as changing gloves before handling the implant (only the surgeon should touch it) – the “non-touch technique” (7).

The most important aspect of successful treatment is the strict aseptic preparation of the implant sac, and surrounding it with viable and well-vascularised tissues (11). Precise haemostasis during surgery is very important in keeping a clear surgical field and having good visibility of the prepared structures, which could prevent damage to the implant (18). There are also some predispositions within different breeds, which should not be ignored. Based on our experience, the dogs’ temperament, and ability to show pronounced facial expressions (i.e. the German Shepherd), inversely correlates with the successful tolerance of the ear implants (i.e. the Bullterrier).

A specific animal temperament can make postsurgical wound care difficult. Unlike humans, animals suffer minor injuries more often, and for this reason the precise determination of the percentage of implant failure caused by trauma, iatrogenic injury, primary, or secondary infections requires further clinical studies.

References