

ORIGINAL ARTICLE

EFFECT OF DIFFERENT SUTURE MATERIALS ON WOUND HEALING: A CLINICAL STUDY

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ABSTRACT:

Background: Suture materials play an important role in healing of wounds, enabling reconstruction and reassembly of tissue separated by a surgical procedure or a trauma, and at the same time facilitating and promoting healing and hemostasis. The present study was aimed to examine the speed of wound healing and complications after the use of three different absorbable synthetic suture materials [catgut, polyglycolic acid (Dexon) and polyglactin 910 (Vicryl rapide)], in oral surgery procedures.

Materials & Methods: This study was conducted in Oral and Maxillofacial surgery department from Jan 2014 to May 2015 on 108 patients undergoing root resection or surgical extraction of third molars. The patients were chosen randomly, with 54 maxillary and 54 mandibular surgical interventions. Therefore, each of the suture materials (catgut, Dexon and Vicryl rapide) was used for 9 root resections and 9 surgical third molar extractions in the maxilla, as well as in the mandible (total of 36 surgical interventions for each suture material). **Results:** Vicryl rapide provide better response than catgut and dexon. Local tissue reaction and dehiscence was also lowed with vicryl rapide as compare to others. **Conclusion:** Vicryl rapide has the best properties of the available absorbable suture materials for application in oral surgery. Vicryl rapide contributes more than catgut or Dexon to faster healing of human wounds, with fewer incidences of wound dehiscence and milder local reactions.

Key Words: Catgut, Dexon, hemostasis, Vicryl rapide.

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INTRODUCTION

Surgery is as old as the mankind, and the use of sutures dates back to the times of the earliest human knowledge in the field of surgery.¹

Throughout the history the most diverse suture materials have been used for closing and suturing surgical wounds. The most ancient suture materials included animal tendons and hairs, as well as herbal fibers such as linen, hemp, and different grass species. Some Egyptian papyrus, dating back some 5000 years ago, display scenes of suturing wounds with linen fibers. A famous Roman medicus, Galen, introduced sutures made of animal intestines into the surgery.²

Even today, there is a search for ideal suture material. Suture materials can be broadly classified as naturally occurring and synthetic.³ They can be further classified as monofilament or multifilament (braided), dyed or undyed, coated or uncoated. Several parameters, such as tensile strength, breaking strength, elasticity, capillarity and memory are used to describe physical characteristic of sutures.⁴ In general, braided sutures are more prone to infection and induce greater degree of tissue reaction.

Advantages of braided sutures include ease of handling, low memory and increased knot security. A monofilament suture is a single material. These sutures have decreased tendency of infection, ease of passage through tissue and ease of removal. They possess poor handling characteristics and decreased knot security.⁵

Suture materials play an important role in healing of wounds, enabling reconstruction and reassembly of tissue separated by a surgical procedure or a trauma, and at the same time facilitating and promoting healing and hemostasis.⁶

Sutures used in oral and maxillofacial surgery behave differently from those used for other parts of the body due to differences in the quality of tissue involved, constant presence of saliva, high level of vascularisation and the presence of functions of speech, chewing and swallowing.⁷

CHARACTERISTICS OF AN IDEAL SUTURE⁸

Ideal suture material should:

1. Have good handling characteristics
2. Not induce significant tissue reaction
3. Allow secure knots

4. Have adequate tensile strength
5. Not cut through tissue
6. Be sterile
7. Be non-electrolytic
8. Be non-allergenic
9. Cheap

The aim of the present study was to examine the speed of wound healing and complications after the use of three different absorbable synthetic suture materials.[catgut, polyglycolic acid (Dexon) and polyglactin 910 (Vicryl rapide)], in oral surgery procedures.

MATERIALS & METHODS

This study was conducted in Oral and Maxillofacial surgery department from Jan 2014 to May 2015 on 108 patients undergoing root resection or surgical extraction of third molars. The patients were chosen randomly, with 54 maxillary and 54 mandibular surgical interventions. Therefore, each of the suture materials (catgut, Dexon and Vicryl rapide) was used for 9 root resections and 9 surgical third molar extractions in the maxilla, as well as in the mandible (total of 36 surgical interventions for each suture material).

R in-M uler and Novak-Peter incision was used for root resection and standard edge cut with relaxation for surgical extractions of impacted third molars. Patients were followed-up on the days 1, 3, 7, 14 and 21 postoperatively and were evaluated for following factors

- a) incidence of wound dehiscence (postoperative days 1, 3 and 7); and
- b) occurrence of local tissue reaction (postoperative days 1, 7, 14 and 21).

Patients were monitored for the presence (absence) and incidence of the following side effects such as edema,

hematoma, infection, as well as administration of analgesic or antibiotics. Changes of protruding for more than 1 cm relative to the opposite side were registered as edema, and changes of mucosa color to purple were considered as hematoma. Particular attention was paid to the presence of dehiscence and local reaction (redness of the mucosa, edema, inflammation) for all the three types of suture materials.

Results obtained were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I shows total number of patients and different surgical intervention. Out of 108 patients, 54 were in maxilla and 54 in mandible as well. Surgical intervention performed were root resections (27) and third molar extractions (27) both in maxilla and mandible.

Table II shows various sutures materials and different surgical intervention. Catgut, Dexon and Vicryl rapide were the suture materials used in root resections and third molars both in maxilla and mandible equally (9 each).

Table III shows number of patients with dehiscence on the days 1, 3 and 7 postoperatively. Dehiscence was more with catgut followed by dexon and vicryl rapide. However results were non significant.

Table IV shows number of patients with the presence of local reaction on the postoperative days 1, 7, 14 and 21. Catgut showed maximum number of patients, while vicryl rapide showed minimal. Results were statistically significant.

Table V shows local tissue reactions after suturing with the tested suture materials. Catgut showed maximum gingival redness and odema as compared to dexon and vinyl rapide.

Table I: Total number of patients and different surgical intervention

Total = 108			
Maxilla=54		Mandible=54	
Root resection	Third molar extraction	Root resection	Third molar extraction
27	27	27	27

Table II: Suture materials

Procedures	Catgut		Dexon		Vicryl rapide	
	Maxilla	Mandible	Maxilla	Mandible	Maxilla	Mandible
Root resection	9	9	9	9	9	9
Third molar extraction	9	9	9	9	9	9

Table III: Number of patients with dehiscence on the days 1, 3 and 7 postoperatively

Suture Materials	Postoperative Day		
	1 st	3 rd	7 th
Catgut	0	5	9
Dexon	1	7	7
Vicryl Rapide	0	3	4

Table IV: Number of patients with the presence of local reaction on the postoperative days 1, 7, 14 and 21

Suture Materials	Postoperative Day			
	1 st	7 th	14 th	21 st
Catgut	15	14	4	0
Dexon	18	15	3	1
Vicryl Rapide	13	7	1	0

Table V: Local tissue reactions after suturing with the tested suture materials

	Catgut	Dexon	Vicryl Rapide
Gingival color unchanged	45%	45%	50%
Gingival Redness	40%	35%	60%
Gingival Redness without subjective Symptoms	5%	5%	0%
Gingival redness with oedema & subjective Symptoms	9%	6%	0%

RESULTS

Then choice of the type and size of surgical suture material depends on the site, specific features and conditions of the tissue to be sutured. Suture material is a foreign body implanted into the tissue, thus provoking local tissue reaction. This is particularly evident for suturing in the oral cavity that is characterized by specific environmental conditions: constant humidity and presence of abundant amounts of microorganisms.⁹ A widest selection of surgical sutures of diverse physicochemical features is currently available in the market worldwide. Considering the wide range of products offered in the market a "modern surgeon" must, besides his medical proficiency, be informed about the latest surgical suture materials, i.e. their origin, application and features.¹⁰

A surgical wound never attains the same cutaneous tensile strength as of normal uncut skin. Two weeks after suturing, 3-5% of original strength will be achieved by a surgical wound. By the end of third week, 20% of the ultimate wound strength is achieved, and by one month only 50% of wound strength is attained. All sutures are foreign bodies and produce an inflammatory response in the host dermis. Peak inflammatory response is seen between second and seventh day with abundance of polymorphonuclear leukocytes, lymphocytes, and large monocytes in dermis. Between the third and eighth day, the epithelial cells deeply invade the suture tracts.¹¹

In present study, we evaluated effect of different suture materials in wound healing. This study was conducted in patients undergoing root resection or surgical extraction of third molars. The patients were chosen randomly, with 54 maxillary and 54 mandibular surgical interventions (Table I). Therefore, each of the suture materials (catgut, Dexon and Vicryl rapide) was used for 9 root resections and 9 surgical third molar extractions in the maxilla, as well as in the mandible (total of 36 surgical interventions for each suture material) (Table II).

In present study, patients were evaluated for dehiscence on the days 1, 3 and 7 postoperatively. Dehiscence was more

with catgut followed by dexon and vicryl rapide. However results were non significant (Table III).

Filho et al.¹² concluded that polyglactin 910 is clinically excellent because it does not allow adherence of plaque and is well suited for handling and it shows no intensive local reaction. It enables easy and efficient passing through tissue with minimum resistance 16, 17. Our experiences with Vicryl are positive and agreeable with these.

Wallace et al.¹³ compared polyglycolic acid, silk, chromic and flat catgut used on 52 respondents. Tissue reaction was studied and classified clinically and histologically on the days 3, 5, 7 and 14 after oral surgical intervention. Polyglycolic acid stitch (Dexon) caused the mildest tissue reaction, milder than silk, chromic and flat catgut. Besides suggesting easier stitching with Dexon than with silk, they said that Dexon stayed present in tissue after implanting for 16–20 days; catgut was absorbed in 3–5 days, and chromic in 7–10 days. According to these authors, Dexon seems to have properties closer to ideal suture material than any other tested.

Our study confirms that Vicryl rapide provokes mildest local reaction, while most severe local reaction is not caused by catgut, but by Dexon, which differs from most other study results. It is also confirmed that Vicryl rapide contributes to faster healing of wounds in humans, with the lower incidence of dehiscence and milder local reactions than with applied catgut or Dexon (Table IV, V).

CONCLUSION

Author concluded that vicryl rapide has the best properties of the available absorbable suture materials for application in oral surgery. Vicryl rapide contributes more than catgut or Dexon to faster healing of human wounds, with fewer incidences of wound dehiscence and milder local reactions.

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