

Efficacy of Murva (*Sansevieria roxburghiana* Schult. and Schult.f.) as a suture material in closure of incisions in third molar surgeries: A prospective study

ABSTRACT

Introduction: Adequate closure of the surgical wound is one of the most important aspects of surgery; improper suturing techniques or improper suturing materials sometimes compromise the success of surgery. Many synthetic materials have replaced the natural materials, which were once used for suturing in the ancient era, and Murva is one of them. There are references of Murva (*Sansevieria roxburghiana* Schult. and Schult.f.) at various contexts of "Sushruta Samhita" where it has been used as a suture material. It is a xerophytic herbaceous plant occurring abundantly in the eastern coastal region of India. The aim of this study is to evaluate the efficacy of Murva fibers as a suturing material in closure of intraoral incision in third molar surgeries.

Materials and Methods: Fifty incisions (Wards incision) placed for the surgical removal of mandibular third molar were sutured with Murva, and follow-up was carried out postoperatively on 1st, 2nd, 3rd, and 7th day. Patients were evaluated for pain, swelling, bleeding, infection, wound dehiscence, local tissue irritation, and bacterial colonization.

Results: On various follow-ups, progressively significant and predictable healing was observed without any uneventful evidence.

Conclusion: The use of Murva as a suture material proved to be effective in closure of intraoral incisions.

Keywords: Antibacterial suture, Murva, natural suture material, third molar

INTRODUCTION

The success of any surgical procedure depends on uneventful healing, which in turn depends on the material and the method employed for the closure. The most common method employed for wound closure in oral surgery is using sutures. A suture is a strand of material used to ligate vessels and reapproximate lacerated or incised tissue.^[1] Indian physician Sushruta gave the first detailed description of a suturing technique and suture materials in 500 BC.^[2] Most surgeons agree that increased surgical time, trauma, and difficulty in tooth removal are important factors in postoperative complications.^[3-5] One of the factors most closely linked to intensity of postoperative pain, and swelling is the type of healing of surgical wound.^[6,7] Suture plays an important role in wound healing after surgical intervention allowing reapproximation of tissues, promoting primary healing, and

the control of hemorrhage. To ensure proper healing, there must be proper positioning of the soft tissues close to their original position in a stable manner, with the least amount of tension, and this can be achieved by selecting appropriate sutures material and proper wound closure technique, thus reducing various complications in the form of wound dehiscence and infection. A lot of research and advancements has been done in the aspect of wound closure. Many synthetic

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materials have replaced the natural materials, which were used for suturing over centuries. Historically, materials used included linen, horsehair, hemp, flax, silkworm gut, kangaroo tendon, umbilical tape, ligament, cotton, iron wire, bark fibers, stainless steel, gold, and silver.^[8] It is true that very few of them are practically tried now, and Murva is one of them. Murva, which is botanically identified as "*Sansevieria roxburghiana* Schult. and Schult.f.," is an herbaceous perennial plant with short, fleshy stem and stout rootstock, occurring abundantly in the eastern coastal region of India [Figure 1]. Its medicinal use includes treatment for abdominal pains, earache, diarrhea, and hemorrhoids. Its leaf has fibrous as well as antimicrobial property.^[9]

The literature on suture materials of various types is extensive; still, an ideal surgical suture material does not exist.^[10] Hence, there is still scope to look forward and examine new suture materials. The aim of this study is to define a very novel and unique type of suture material derived from a widespread and easily available plant called Murva and to evaluate its efficacy as a suture material in the closure of surgical incision after third molar surgery.

MATERIALS AND METHODS

A total number of 84 patients in the range of 18–30 years age group, irrespective of sex undergoing surgical removal of moderately difficult impacted mandibular third molar according to the Pederson difficulty index, were selected [Figure 2a]. After obtaining the Institutional Ethical Clearance and patients' consent, closure was done using Murva as a suture material. Murva suture was obtained by selecting fully grown Murva leaves which were then kept for retting until the leaves get soften. Once the leaves get soften, their parenchyma was separated, and the fibers were drawn longitudinally. The obtained fibers were braided together



Figure 1: Murva (*Sansevieria roxburghiana* Schult. and Schult.f.)

and were autoclaved under 15 psi at 121°C for 15 min before use.

The patients were evaluated for the following:

- Pain
- Swelling
- Bleeding
- Infection
- Wound dehiscence
- Local tissue irritation
- Bacterial colonization.

Patients with good general health and good oral hygiene were included in the study. They had no contraindication to the drugs or anesthetic in the surgical protocol and were operated by a single surgeon with an average surgical duration of 38 min. Patients were made to rinse with 0.2% chlorhexidine solution for 1 min. Inferior alveolar, long buccal, and lingual nerves were anesthetized using 2% lidocaine hydrochloride with epinephrine 1:800,00. A full-thickness Ward's incision was placed, and mucoperiosteal flap was raised. After adequate bone removal, the tooth was removed [Figure 2b]. The flap was repositioned and sutured using Murva as suture material [Figure 2c], closure was done in an interrupted fashion in all patients [Figure 2d-f]. The intraoral sutures [Figure 2g] were removed on 7th postoperative day [Figure 2h].

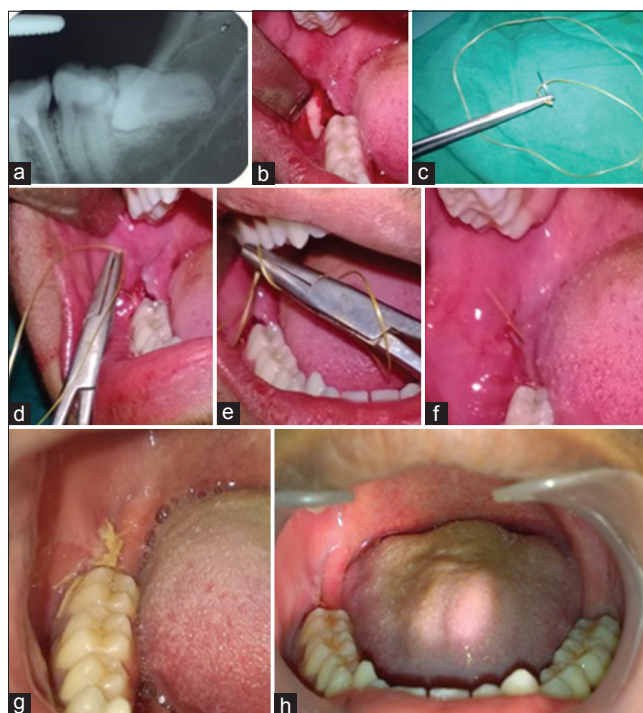


Figure 2: (a) Intraoral periapical radiograph exhibiting impacted right mandibular third molar. (b) Extraction socket after surgical removal of wisdom tooth. (c) Murva suture material. (d-f) Murva being used as a suturing material intraoperatively. (g) Surgical site presuture removal. (h) Surgical site postsuture removal

All the patients had received postoperative instructions and were advised to maintain normal oral hygiene from the day after surgery. Patients were prescribed antibiotics (amoxicillin 500 mg every 8 h for 5 days) and analgesic drugs (diclofenac sodium 50 mg every 8 h for 5 days). The patients were evaluated for the degree of pain,^[11] swelling,^[12] and infection^[13] on 3rd and 7th day, wound dehiscence, and local tissue irritation was observed clinically on 1st, 3rd, and 7th day, and bleeding was recorded on 1st, 2nd, and 3rd day.^[11] Sutures were removed and sent to laboratory for processing on 7th day. After suspension in 1 ml sterile saline, 10- μ l aliquots were seeded on Tryptose agar with 5% blood for total count; Mannitol salt agar for staphylococci and Sabouraud agar for fungi. Cultures were placed in an incubator at 37°C for 24–48 h. All samples were then examined with a light microscope, magnification $\times 100$.^[14] The pain scale^[11] was 5 cm long, subdivided into five equal parts, one end corresponding to no pain and the other end to extremely severe pain [Table 1]. The patients also indicated their subjective perception of bleeding^[11] on the visual analog scale [Table 2], and the degree of swelling^[12] was assessed [Table 3].

Table 1: Visual analog scale to evaluate pain

Score	Inference	Observation
0	No pain	The patient feels well
1	Slight pain	If the patient is distracted, he or she does not feel the pain
2	Mild pain	The patient feels the pain even if concentrating on some activity
3	Severe pain	The patient is very disturbed but nevertheless can continue with normal activities
4	Very severe pain	The patient is forced to abandon normal activities
5	Extremely severe pain	The patient must abandon every type of activity

Table 2: Visual analog scale to evaluate bleeding

Score	Inference	Observation
0	No bleeding	The patient does not detect any blood in saliva
1	Oozing	The patient detects a slight blood, but it is not very noticeable
2	Accidental low bleeding	The patient has low bleeding sometimes
3	Continues low bleeding	The patient has low bleeding often
4	Massive bleeding	Continues high bleeding

Table 3: Scale to evaluate degree of swelling

Inference	Observation
None	No swelling
Mild	Small intraoral swelling confined to surgical field
Moderate	Extraoral swelling in surgical zone
Intense	Extraoral swelling spreading beyond the surgical zone

RESULTS

Murva was used as suture material in 84 patients for the closure of incision after surgical removal of impacted mandibular third molar. This study represents the evaluation and data analysis of 50 patients who gave regular follow-up and excluded the remaining 34 patients, in which the data were not completely available due to lack of follow-up. Among 34 excluded patients, 4 patients skipped the follow-up on 1st postoperative day, 8 patients skipped 2nd day follow-up, the 19 patients skipped the 3rd day follow-up, and 3 patients did not turn up on the 7th day for suture removal.

The mean age of the patients was 24 years (range 19–30 years). Slight pain was experienced in 62% of cases, mild pain in 16% of cases, and no pain in 22% of cases on 3rd postoperative day. The pain experienced in the operated cases gradually decreased to slight pain in 8% and no pain in 92% of the cases on the 7th postoperative day. Swelling was mild in 48%, moderate in 34%, intense in 8%, and none in 10% of the cases on 3rd postoperative day, whereas on 7th postoperative day, it was mild in 22%, moderate in 2%, and none in 76% of the cases. Oozing of blood was observed in 4% of cases on 1st postoperative day. Local tissue irritation and infection was absent in all the cases on subsequent follow-up. Wound dehiscence was noticed in 37% of cases. Pathogenic bacteria as well as fungi were missing on suture samples [Table 4].

DISCUSSION

Whether inflicted by chance or sustained during a surgical procedure, every wound is simply a disruption of the normal continuity of tissue. When tissue has been disrupted so severely that it cannot heal naturally, it must be held in opposition until the healing process provides the wound with sufficient strength to withstand stress without mechanical support. Sutures play an import role in the closure of wounds by primary intention which demands a proper closure and close approximation of wound edges. In this study, mean age of the patients was 24 years presenting high incidence of impacted mandibular third molar in young population. These findings are similar to other studies by Padhye *et al.*^[15]

As the severity of pain and bleeding are said to be indicators of a patient's comfort during the postoperative period after third molar removal. Minimizing postoperative pain and bleeding allows patients to return to normal work and social activities in a shorter time.^[11] In the study, 78% patients experienced pain on 3rd day while 8% experienced pain on 7th postoperative day, which may be due to the inflammatory reaction or the tissue response during healing. The incidence

Table 4: Contd...

Age (years)	Sex	Pain		Swelling		Infection		Bleeding		Wound dehiscence			Tissue reaction			Bacterial colonization	
		3 rd day	7 th day	3 rd day	7 th day	3 rd day	7 th day	1 st day	2 nd day	3 rd day	7 th day	1 st day	3 rd day	7 th day	1 st day	3 rd day	7 th day
21	Male	No pain	No pain	Moderate	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
25	Female	Mild	Slight	Moderate	Mild	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
25	Female	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
25	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Present	-	Absent	-	Absent
25	Male	Slight	No pain	Moderate	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
27	Male	No pain	No pain	Moderate	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Present	Absent	Absent	Absent	Absent
19	Male	Mild	Slight	Intense	Mild	Absent	Absent	Oozing	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Male	Slight	No pain	None	None	Absent	Absent	No bleeding	-	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
28	Female	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Absent	Absent	Absent	Absent
26	Female	-	Slight	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
26	Male	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
27	Female	-	No pain	-	None	-	Absent	No bleeding	no bleeding	-	Absent	-	Absent	-	Absent	-	Absent
25	Female	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Present	Present	Present	Absent	Absent	Absent	Absent
20	Female	No pain	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
24	Female	Mild	Slight	Moderate	Mild	Absent	Absent	No bleeding	-	no bleeding	Absent	Present	Present	Present	Absent	Absent	Absent
20	Female	Slight	No pain	Mild	None	Absent	Absent	No bleeding	no bleeding	No bleeding	Present	Present	Present	Present	Absent	Absent	Absent
21	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Present	-	Absent	-	Absent
23	Female	Mild	Slight	Moderate	Mild	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Present	Absent	Absent	Absent
22	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
26	Female	No pain	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Absent	Absent	Absent	Absent
25	Male	Slight	No pain	Moderate	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
20	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
24	Female	Slight	No pain	Moderate	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
29	Male	No pain	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Absent	Absent	Absent	Absent
27	Female	No pain	No pain	Moderate	Mild	Absent	Absent	No bleeding	-	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
26	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Present	-	Absent	-	Absent
27	Female	Mild	Slight	Intense	Mild	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
19	Male	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
24	Male	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Absent	Absent	Absent	Absent
27	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Present	-	Absent	-	Absent
26	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
19	Male	Slight	No pain	Moderate	Mild	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
20	Female	No pain	no pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
23	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
24	Female	No pain	No pain	None	None	Absent	Absent	No bleeding	-	no bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent
26	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent
23	Male	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Present	Present	Absent	Absent	Absent	Absent

Contd...

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Age (years)	Sex	Pain		Swelling		Infection		Bleeding			Wound dehiscence			Tissue reaction			Bacterial colonization		
		3 rd day	7 th day	3 rd day	7 th day	3 rd day	7 th day	1 st day	2 nd day	3 rd day	1 st day	3 rd day	7 th day	1 st day	3 rd day	7 th day	Pathogenic bacteria	Fungi	
20	Male	Mild	No pain	Moderate	None	Absent	-	No bleeding	no bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	-	-	-	-
25	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	-	Absent	Absent	Absent
22	Male	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
19	Female	-	No pain	-	Mild	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent	Absent	Absent
24	Male	No pain	No pain	Mild	None	Absent	Absent	No bleeding	-	No bleeding	Absent	Present	Absent	Present	Absent	Present	Absent	Absent	Absent
25	Male	Slight	No pain	None	None	Absent	Absent	Oozing	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
27	Female	No pain	No pain	Moderate	None	Absent	Absent	no bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
26	Male	-	No pain	-	None	-	Absent	No bleeding	No bleeding	-	Absent	-	Absent	-	Absent	-	Absent	Absent	Absent
24	Male	No pain	No pain	None	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent
25	Female	Slight	No pain	Mild	None	Absent	Absent	No bleeding	No bleeding	No bleeding	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

■ : Excluded from the study due to skip in follow up

rate of postoperative bleeding after third molar extraction varying from 0.2% to 5.8% has been reported.^[16] In our study, blood ooze was observed in 4% of the cases from sutured wound on the 1st postoperative day. On questioning, it was found that the patients did not follow postoperative instructions carefully. Although patients were informed not to brush over the suture, they tried to clean it by brushing over it. Swelling or surgical edema usually reaches a maximum level 2–3 days postoperatively and should subside by 4 days and resolve by 7 days.^[17] In the present study, postoperative swelling was observed in 24% of the cases on 7th postoperative day, as compared to 35% observed by studies of Khan *et al.*^[18] Sutured wound may undergo wound dehiscence, which may enhance the risk of infection.^[19] It is defined as the development of a separation of the layers of a surgical wound, which results in the absence of primary coverage.^[20] It occurs mainly due to tension incorporated after removal of third molar^[18] and can be avoided by good practice of tension-free suturing and selection of correct suturing material.^[21] In the present study, due care was taken to avoid the over tightening of the suture though wound dehiscence was observed in 37% of the cases, these results are in accordance with the study of Khande *et al.*^[22] Sadig and Almas described the role of overly tight or loose suturing techniques using inappropriate size and suture material as a risk factor in the development of wound dehiscence.^[20] A common complication of surgery that results in delayed healing is infection, which can even lead to systemic sepsis. It is a known fact that suture material increases the risk of wound sepsis by serving as an adherent foreign body and infections often begin around the suture materials left within the wound.^[23] Edlich *et al.* have demonstrated that the physical properties and configuration of suture materials influence the degree of surgical site infection.^[24] In the present study, infection was absent in all the cases, no significant pathogenic bacterial adherence to suture material was found, which marks its inherent antimicrobial property as described by Philip *et al.*^[25] The ability of the Murva to inhibit the growth of several bacterial and fungal species is an indication of its antimicrobial potential, which makes the plant a candidate for bioprospecting for antimicrobial drugs. Physical properties such as a plasticity and very poor memory provide good knot security, but poor elongation, which does not allow an easy knot tying. Sutures are known to lose their strength by the actions of enzymes; however, in our study, we did not find the loosening of the material strength, and it retained its maximum strength until its purpose was served. The strength would be confirmed by the nongiving away of the sutures during routine work by the patient in the postoperative period and also by gentle parting of wound margins after suture removal. It was observed that the age of

the leaves matters for the strength of the fiber. Fibers from young leaves do not have much strength. The right type of leaf is the one, which has turned yellowish green. The overall impression of the handling characteristics of the material was highly favorable. Since it is a natural fiber, it possesses certain amount of tissue drag, which may be comparable to that of cotton thread.

CONCLUSION

This study indicates that Murva can be economical and viable suture material because of its antimicrobial activity and the ability to hold the tissue edges until they gain strength. Murva can be effectively used as an alternative suture material as being natural, economical, easily available and biocompatible material, having satisfactory results along with added antimicrobial activity and good tensile strength.

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Conflicts of interest

There are no conflicts of interest.

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