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REVIEW ARTICLE

# Round Pendant Around the Neck–Thyroid. A Review

**P. R. Venu Gopal · P. Kumar · George K. George · Naveen Hood · Lidiya James · Milthi Manoj · Joseph Francis**

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**Abstract** The rare situation of thyroid stone is discussed with literature review and case report. A case of isolated solitary stone of the thyroid is documented here. There are incidences of calcification in the thyroid gland commonly associated with carcinoma thyroid and multinodular goiter. But solitary stone of thyroid is reported rarely and one such case is reported from India. The possibility of malignancy is high, in case of calcification of thyroid swellings. Hence, isolated calcification should be surgically treated even if fine needle aspiration cytology is negative for malignancy.

**Keywords** Thyroid stone · Ring calcification · Dystrophic calcification · Papillary carcinoma · Multinodular goiter

## Introduction

Multinodular goiters are very common in our subcontinent especially in the sub-Himalayan and Western Ghat areas. Hemorrhage of the multinodular goiter nodules may produce calcification. Similarly, papillary carcinoma of the thyroid can also have calcification [1, 2]. But solitary stone of the thyroid is a well-described entity with features of solitary lesion, egg shell calcification, and no other site of calcifications on the rest of the gland. Few cases of such thyroid stones are described in literature. Mostly, literature is highlighting the high incidence of malignancy in cases of calcifications, suggesting surgical treatment as the treatment of choice [2, 4, 5]. The literature reviews are few and the problem is discussed with a case report.

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## Clinical Presentation

A 60-year-old female patient presented with swelling in front of the neck of 10 years duration. Recently, an increasing fullness was noticed on the left sternoclavicular region with pain. There was no history of drug intake or medications for thyroid disease. There was no history of trauma. Clinically, there was a hard swelling at the left sternoclavicular region which, on ultrasound, shows a hyperechoic well-defined lesion with post-acoustic shadowing (Fig. 1). Fine needle aspiration cytology (FNAC) was attempted on the swelling but needle was not entering the lesion and hence abandoned.

Radiological study showed a ring calcification on the left lower part of the neck (Figs. 2 and 3). CT study showed heterogeneously enhancing relatively low-density well-defined lesion measuring approximately 32×24×50 mm with dense circular calcification (23×22 mm) with central lucent area noted within the lesion (Fig. 4). The left lobe was enlarged more than the right with normal texture.

*Procedure* A classic Kocher incision was made and the thyroid gland was explored; it showed enlarged left lobe with a solitary hard stone at the lower pole (Fig. 5). Otherwise, the gland appeared to be a colloid goiter. Considering the possibility of malignancy, total thyroidectomy was done on the left side and near total on the right side.

*Gross Findings* The thyroid gland was enlarged with a single globular and well-circumscribed hard mass, measuring 3 cm in diameter, located at the lower pole of left lobe with normal but enlarged lobe (Fig. 6). The right lobe appeared normal. The lesion was hard and well-defined and it was cut open to view the inside. The inside was brownish white in color and fleshy to feel (Fig. 7). The total thyroidectomy specimen was X-rayed to identify other calcifications (Fig. 8).

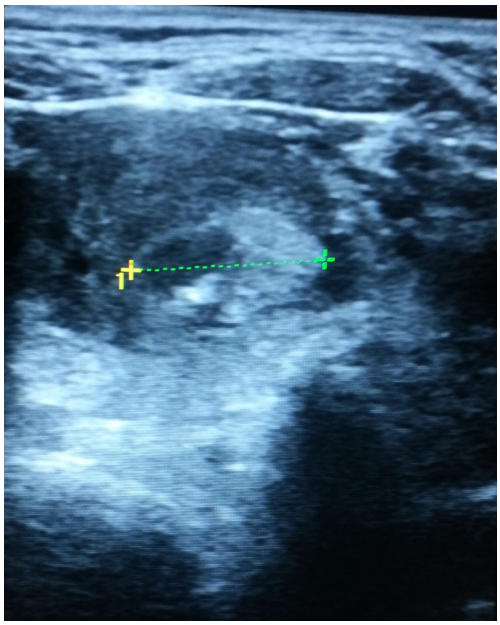

**Fig. 1** USG neck showing hyperechoic well defined lesion with post-acoustic shadowing

*Microscopy* Follicles of varying size lined by flattened epithelial cells and normofollicular cells and stroma showed fibrosis, hemorrhage, and calcification. Impression is nodular colloid goiter.

## Discussion

Very few cases have been documented in literature to have calcification in thyroid with a stone formation [6]. Histologically, thyroid calcification is divided into the psammomatous and dystrophic types. Calcification of diseased gland can be hyperemic calcification or dystrophic calcification. Psammomatous calcification consists of laminated round

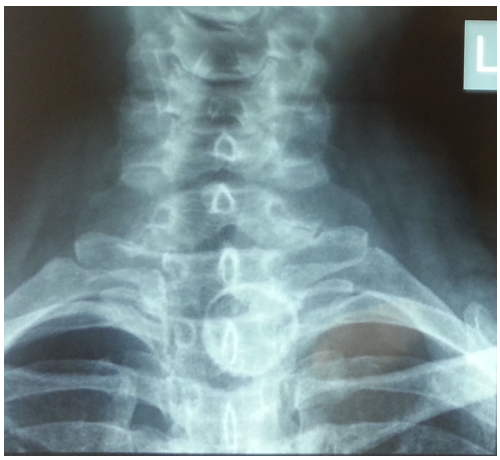

**Fig. 2** X-ray neck AP view—ring calcification on the left lower part of neck

**Fig. 3** X-ray neck lateral view—ring calcification on the left lower part of neck

calcium deposits in the epithelium. They can be detected as microcalcification in ultrasound studies. There are studies which have shown 18.5 % high incidence of papillary carcinoma in this type of calcified lesions even if the FNAC is negative. An 18.5 % higher incidence of papillary thyroid carcinoma in case of psammomatous calcification which can be detected as microcalcification on ultrasonography is now well accepted [1, 2]. By contrast, dystrophic calcification consists of nonlaminated amorphous deposits in fibrous tissue septa rather than in the epithelium. Inspissated colloid

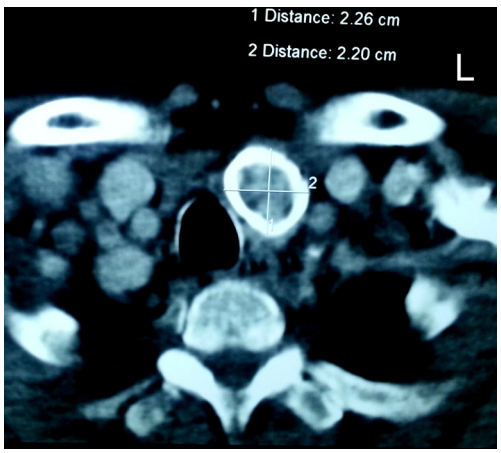


**Fig. 4** CT study showing heterogeneously enhancing relatively low-density well-defined lesion measuring ~32×24×50 mm with dense circular calcification (23×22 mm) with central lucent area noted within the lesion

**Fig. 5** Thyroid gland showed enlarged left lobe with a solitary hard stone at the lower pole

calcifications in benign thyroid lesions may mimic microcalcifications in thyroid malignancies [1]. Peripheral calcification is one of the patterns which is most commonly seen in a multinodular thyroid, but it may also be seen in malignancy. Benign nodules have coarse calcifications, especially with long disease duration [3]. On literature review, we found that there was 18.5 % prevalence of malignancy among thyroid nodules with peripheral calcification [4], and thus, chances of malignancy were higher in patients who showed calcification in a solitary nodule. The dystrophic calcification occurs in diseased glands with nodular changes, hemorrhage, and long-standing solitary lesions. Hemorrhage into thyroid nodules is common but egg shell calcification is very rare. So much so, surgery should be recommended in such cases, regardless of the result of the fine-needle aspiration cytological findings [5]. However, there was no increase in the incidence of malignancy in the cases of mutinodular goiter showing calcification.

The first report of hemorrhage into the thyroid gland is described by Simon in 1894. To date, reported cases about hemorrhage into the thyroid was caused by trauma, cervical hyperflexion, a manual blow to the back of the head, lifting a heavy weight, straining at defecation, and even during household work. Ring-shaped calcifications may simulate the

**Fig. 6** Thyroid gland enlarged with a single globular and well-circumscribed hard mass, measuring 3 cm diameter located at the lower pole of left lobe with normal but enlarged lobe

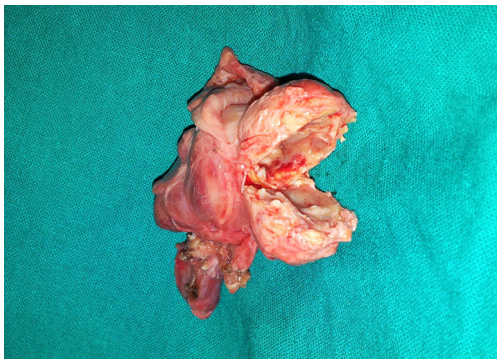

**Fig. 7** The lesion was hard and well-defined and it was cut open to view the inside. The inside was *brownish white* in color and fleshy to feel

eggshell appearance. These include aneurysms of the great vessels, parathyroid tumors, pulmonary arteries in pulmonary arterial hypertension, thymic cysts, and thyroid tumors.

Eggshell calcification of thyroid is rare and only three cases have been reported. One was an ultrasonic appearance of an eggshell calcification of a thyroid nodule reported in 1978 by Gooding and the other was eggshell calcification in follicular thyroid carcinoma reported in 2005 by Cheng et al. [7]. The last and recent one was double eggshell calcification in the thyroid in 2007 by Vandemergel [8]. Egg shell calcification is one of the patterns of dystrophic calcifications and is often associated with multinodular goiters [7]. It was generally thought to be an indicator of benignancy [7]; however, cases of papillary carcinoma [5, 7] and undifferentiated carcinoma associated with this type of calcification have been reported. In the series of Taki et al., 43 % (6 cases out of 14 cases) of this type of calcification was associated with cancer, and all of them were papillary carcinoma [9]. Typical benign nodules are well-defined, mostly cystic, and hyperechoic relative to the adjacent parenchyma (96 % benign). These nodules have eggshell calcification and a thin, echolucent halo around the entire lesion, and they always contain internal debris. Lesions demonstrating eggshell calcification and a thin echolucent halo around the entire lesion are most often benign. Some authors have found that the halo sign is present in 21–33 % of thyroid cancers. But Cheng considered that type of thyroid calcification as not a good indicator of benignancy [7].

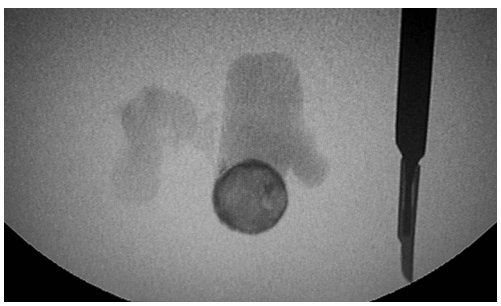

**Fig. 8** X-ray was done for the resected specimen to show no other calcification other than the stone

Frates et al. [10] reported that a rim calcification doubled risk of malignancy compared with similar nodules without calcifications and the risk of malignancy increased when a nodule was solitary and solid. However, the presence of a rim calcification showed no statistical significance in the differentiation of a malignant nodule from a benign one [11].

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ORIGINAL ARTICLE

# Extradigital Glomus Tumor—a Rare Cause for Undiagnosed Chronic Pain in Unusal Sites

**P. R. Venugopal**

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**Abstract** Glomus tumor is a benign vascular tumor derived from the modified smooth muscle cells of the glomus body. The single most common site is the subungual region of the finger, but other common sites include the palm, wrist, forearm, and foot. In this article, we present a rare situation of glomus tumor occurring on the back of the chest over the scapular area in an elderly male patient. The tumor cells exhibited positive expression for CD34 and smooth muscle actin. This paper highlights the fact that a glomus tumor is a benign neoplasm that may occur in multiple locations. Therefore, the significance of a histological and immunohistochemical approach for a correct characterization of this lesion is required.

**Keywords** Glomus tumor · Extra digital glomus tumor · Scapular pain · Limberg flap

## Introduction

Glomus tumor is a benign vascular tumor derived from the modified smooth muscle cells of the glomus body. The tumor develop as small pinkish red nodules that are usually located in the nail bed and deep dermis or subcutis of the upper or lower extremity. The single most common site is the subungual region of the finger, but other common sites include the palm, wrist, forearm, and foot. Extra digital glomus tumors are occasionally difficult to diagnose, owing to their nonspecific clinical characteristics, including unusual sites and symptoms which vary compared with those of classical glomus tumors. Therefore, it is crucial to include glomus tumors in a differential diagnosis of patients with extra digital lesions, showing the features of small or unrecognized lesion with disproportionate pain and sensitivity to touch and cold.

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## Case Report

Sixty-seven-year-old male patient presented with excruciating pain over the left scapular area for 6 years. He had been treated with triamcinolone injections, probably suspecting tendinitis, and later, an excision was done by some surgeons but the pain was persistent. He gave a history of exacerbation of pain while taking a bath and when exposed to cold. Clinical examination revealed a vague swelling on the back of scapular area on the left side (Fig. 1). There was wasting of the infraspinatous muscle, trapazius, and latissimus dorsi.

Ultrasound examination revealed a small well-defined hypo-echoic mass. MRI scans showing a hyper-intense lesion on the T2-weighted image (Fig. 2).

With clinical diagnosis of glomus tumor with recurrence (one time excision was done by a neurosurgeon who failed to localize and remove the lesion), a wide excision with 6 cm all around was done and the wound was closed with Limberg flap. The defect of 6 cm on the back was covered with thick skin and subcutaneous tissue of the nearby area using this simple flap. A direct closure could have produced a thick painful scar and defect, and a skin graft will produce a depressed painful scar over the pressure-bearing area.

*Specimen* The skin excised on the section showed a small pinkish red well-defined pearl like lesion of 2 cm (Fig. 3), and histopathology examination revealed a lesion composed of solid sheets of cells interrupted by vessels of varying size (Fig. 4). The tumor cells exhibited positive expression for CD34 and smooth muscle actin. Immunohistochemically, the tumor cells were reactive for smooth muscle actin

**Fig. 1** External appearance of the case with flap design

(SMA) and vimentin (VMT). Patient was symptom free for the last 6 months.

## Discussion

Glomus tumors are neoplasm of the glomus body, a neuromyoarterial unit found within the reticular dermis that serves as a specialized arteriovenous anastomosis. The glomus body is made of preglomic arterioles derived from the small arterioles that supply the dermis and is lined by plump cuboidal endothelial cells and surrounded by longitudinal and circular muscle fibers. Scattered throughout the muscle fibers are

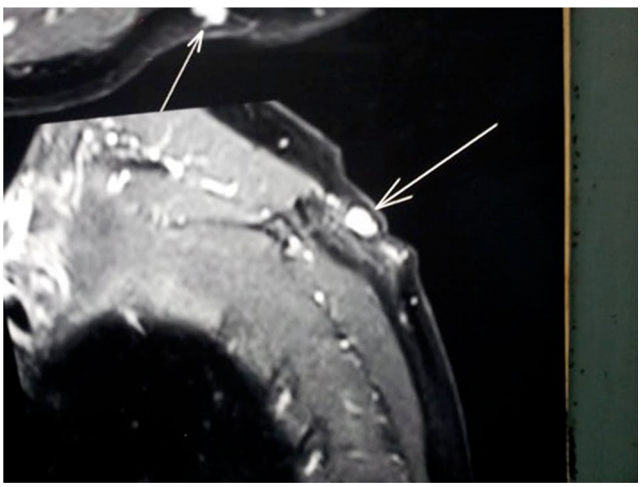

**Fig. 2** MRI scans showing the lesion

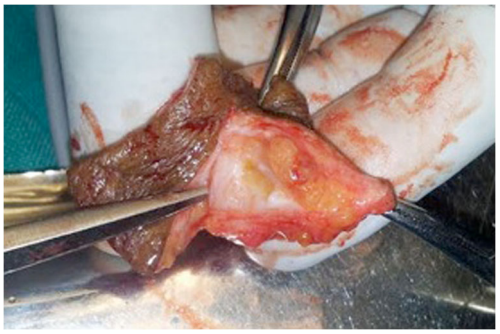

**Fig. 3** Excised skin with lesion

rounded epitheloid glomus cells. The arterial end of the glomus body or Sucquet-Hoyer canal is surrounded by modified smooth muscle cells called glomus cells that act to regulate blood flow to the skin in response to temperature changes. Histologically, depending on the predominant component, there are three variants of glomus tumor, namely (1) solid, with poor vasculature and scant smooth muscle component; (2) angiomatoid (glomangioma), with a predominant vascular component; and (3) glomangiomyoma, with prominent vascular and smooth muscle components [1]. The tumor cells exhibit positive expression for CD34 and smooth muscle actin. It accounts for 1–6 % of all soft tissue tumors and 1–5 % of hand tumors. Glomus tumors present mostly as solitary masses with a rarer multiple variant. Since the glomus apparatus are more concentrated in the digits, palm, and sole, the lesions are more common in upper extremity. Malignant transformation is extremely rare. Folpe et al. [2] proposed the following classification criteria for malignant glomus tumors: (i) deep location and a size of >2 cm, (ii) presence of atypical mitotic figures, or (iii) combination of moderate to high nuclear grade and mitotic activity (5 MFs/50 HPFs).

Extra digital glomus tumors are occasionally difficult to diagnose, owing to their nonspecific clinical characteristics, including unusual sites and symptoms which vary compared with those of classical glomus tumors. Therefore, it is crucial to include glomus tumors in a differential diagnosis of patients

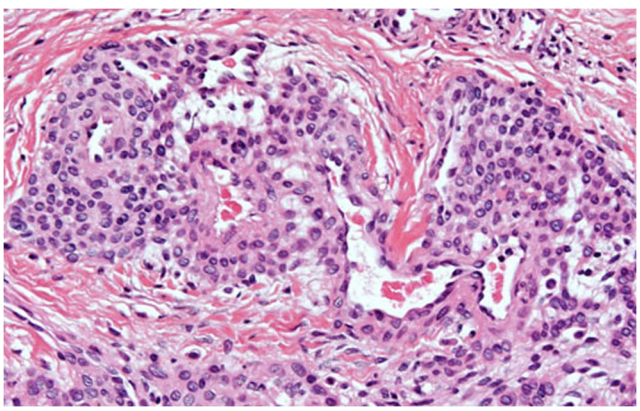

**Fig. 4** Histological appearance of the tumor

with extra digital lesions, showing the features of small or unrecognized lesion with disproportionate pain and sensitivity to touch and cold. Substance P and TRPV1 were expressed moderately to strongly in glomus cells with no differences in their expression between digital and extra digital glomus tumors, which is responsible for the excruciating pain and sensitivity to cold.

A review of the literature suggests that the extra digital distribution along the upper extremity may be more frequent. The forearm has been noted to be the most common extra digital location, while the shoulder and upper back are the least frequent [2, 3]. The classic triad of symptoms described for glomus tumors consists of pain, localized tenderness, and cold hypersensitivity. Only 20 % of extra digital glomus tumors were diagnosed correctly by the initial physician. The mean size of the tumors was 1.9 cm. The average duration of symptoms was few years. The data indicate that in the subcutaneous location of the extra digital areas, the tumor only becomes visible at a late stage, which correlates with the enlargement of the mass. The absence of objective findings frequently results in a diagnostic delay, a finding that is confirmed by the protracted duration of symptoms observed in the majority of series and case studies. Various diagnostic imaging techniques have been reported to enhance the ability to detect these lesions. There are no specific imaging techniques to aid in the diagnosis. Ultrasonography, despite its low specificity, may aid in locating the lesion. MRI provides more details of the lesion and its association with the adjacent structures [4]. It must be emphasized that a diagnosis relies on a high index of clinical suspicion.

In our case, the lesion was over the scapular area where the skin is very thick and hence it could not be palpated well. One attempt of excision was done by somebody but they could not remove the lesion, and hence the pain was persistent even after the surgery. So, we have done a wider excision and closed it with the Limberg flap since it was a pressure-bearing area. The shoulder and scapular area is a rare site for glomus tumor [5, 6].

## Conclusion

Triad of pain, localized tenderness, and cold hypersensitivity of unusual areas has to be investigated for rare glomus tumor. Cases are reported, showing that glomus tumors are not so rare to produce such chronic pain especially in the shoulder area and knee joint area. These cases can be better diagnosed with MRI scan of the area and excision with wide margin in curative.

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*Original Article*

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# Radical Excision of Low Flow Vascular Malformations-Choice of Treatment in Early Childhood

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**Abstract**

The low flow vascular malformations are very common in children. The vascular malformations can increase in size and invade locally that could lead to, bleeding deformities and growth defects. There are many modalities of treatment such as embolisation, sclerotherapy and excision. The low flow malformations can be treated and cured with radical excision. This article discuss a few cases treated by radical excision and highlights the importance of surgical treatment in early childhood with the help of microsurgical techniques.

**Keywords**: Vascular Malformation; Low Flow Malformations; Radical Excision; Sclerotherapy; Embolization.

## Introduction

The vascular anomalies are very common in children. They can be either malformations or vasoproliferative lesions. The 'vascular malformations' are always present at birth, enlarge with growth of the child and they never involute in adulthood. They can produce secondary changes like gigantism, local invasion and spread leading to physiological obstruction and deformities. The vascular malformations are subcategorized based upon the histologic tissues like lymphatic, capillary, venous, arterio-venous, and mixed malformations. The low flow malformations are mainly seen in head and neck region and limbs. Generally the low flow anomalies are treated with sclerotherapy and embolisation. The total excision of well-defined low flow lesions is possible and it will give better cosmetic and functional results. In this article, few of such cases treated by surgical method are discussed with literature review.

## Materials and Methods

5 children with large vascular malformations treated in a period of 2 years were studied and analysed. The basic investigation of choice was Doppler vascular study and that helps to identify the flow rate and type of vessels and tissues involved. The cases of malformations in the head and neck regions were investigated with CT scan and made it clear about the extend of the malformations. Clinically well-defined masses with low flow rate and small arterial feeders were selected for surgical excision. Even if the lesions appear well defined there were multiple vascular channels extending to the surrounding tissues. A child with large malformation of the neck [Figure 1] had vascular connections to external jugular vein and braches from external carotid artery. The local excision of the lesion was done under microscopic magnification. The limb vascular malformation was done with help of tourniquet control.

**Fig. 1:** 6 months old child with huge low malformation with attachment to the internal jugular and extension to the parotid.

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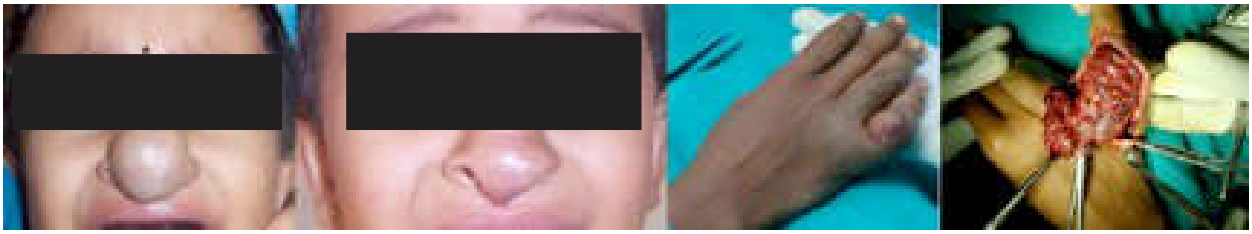

**Fig. 2:** lip vascular malformation in two children

**Fig. 3:** Malformations on the nose of a child and hand with early local gigantism

## Discussion

The vascular anomalies are a group of conditions with complexity of management due to the varying types of histological components, velocity factors of the blood flow and neoplastic properties of the tissues. There are many modalities of treatment like sclerotherapy, embolisation, excision and even radiotherapy. The complications of treatment are equally significant and hence many of the cases are left alone leading to long-term sequel like bleeding, obstruction to airway, and incurability.

In 1982, Mulliken and Glowacki proposed a binary classification system for vascular anomalies based on natural history, cellular turnover, and histology [1,2,3].

The International Society adapted the basic binary system of classification of the vascular anomalies for the Study of Vascular Anomalies (ISSVA) [4,5,6,7]. The modified ISSVA system allows a systematic approach to vascular lesions that predictably correlates the clinical history, disease course, and treatment options, making the system clinically useful. The modified system incorporates the radiological studies like Doppler, MRI and angiograms, histopathological and histochemical studies in predicting the types and classification.

**Table 1:** Comparison between Malformations and Vasoproliferative lesions

| Features | Malformations | Vasoproliferative lesions |
|---|---|---|
| First appearance | birth | After birth |
| Growth | Continue to adulthood | Limited growth |
| Static phase | No static phase | Static phase present |
| Involution | No involution | After growth it involutes |
| Stimulating factors | Trauma, surgery, oral pills, hormones | No effects |

The International Society for the study of Vascular Anomalies (ISSVA) classification system divides vascular anomalies into two primary biological categories: (1) vasoproliferative or vascular neoplasms and (2) vascular malformations. The major distinction between the 2 categories is the presence of increased endothelial cell turnover in the former [6].

Congenital vascular malformations (CVM) are made of dysplastic vessels with no cellular proliferation. The vascular malformations will have structural abnormalities of the capillary, venous, lymphatic, and arterial channels that grow in proportion with growth of the child [5,6,7,8]. This is the main reason why the lesions should be excised early in childhood.

The next factor of importance is the flow rate. The high flow malformations are arteriovenous malformations and arteriovenous fistulas. The low

flow malformations are morphologically capillary and venous malformations. These have components of vascular, lymphatic and hamartomatous components. Those hamartomatous lesions may enlarge with pain and limitation of movements of the joints. The pure capillary and venous malformations will spread locally producing mass effect, local invasion and secondary changes like ulceration and bleeding. Low flow group have the property of platelet segregation. Hence we suggest surgical removal of the low flow malformation in early childhood.

Frequently many vascular centers treat low flow vascular malformations by sclerotherapy and embolisation. The procedure of sclerotherapy is done using materials like ethanol, sodium tetradecyl sulfate, and hypertonic saline. The results of sclerotherapy are unpredictable [9,10]. Prior to sclerotherapy, percutaneous phlebography is necessary to visualize vascular pattern inside the lesion and the flow into the adjacent vascular system [5]. The embolisation requires technologies like invasive vascular procedures (trans arterial or trans venous catheterization) especially in head and neck region, which is difficult in cases of children [13,14,15]. At times, sclerotherapy done for lesions of the limbs can produce thromboembolic complications. The thromboembolic necrosis of the lip and nose is not rare. The possibility of thromboembolic complications in head and neck regions cannot be neglected. Perioperative embolosclerotherapy has been performed in many centers, as preliminary preparation to reduce subsequent surgical morbidity. Yet another modality of treatment is steroid injections into the large lesions. The endothelial maturation process can be stimulated by the steroid, but the results are not satisfying. The intra lesion steroid therapy may help in reducing the problems of platelet segregations in large vascular anomalies (Kasabach Meritt phenomenon)[16].

Considering all, it is advisable to take decision on radical excision after studying the cases with Doppler, CT and/or MRI. The surgical management is performed in many ways. There are some reports on performing suturing of the vascular malformations all around. The aim of doing the suturing is to prevent bleeding and to reduce scarring and contractures [17]. In all other cases a multimodality and multidisciplinary approach is advisable [18]. If the lesions are localized and low flow anomaly, primary treatment option is total excision and primary reconstruction [19].

For performing the complete excision it is preferable to have magnification and finer dissection, to avoid complications like injury to small nerves or major vessels. The magnification can be a magnifying loop or an operating microscope. While dissecting the vascular malformation, the feeding or draining vessels can be localized with portable Doppler probe of 8MHz and 5 MHz These localized major feeders can be ligated first, lifting the mass towards its arterial feeder. The arterial feeders will be small and ligation will be easy. If the artery is primarily ligated the mass may reduce in size so that missing of some venous channels can occur.

Whenever dissection is done in areas like parotid the facial nerve should be identified first and then only proceed for excision of the malformation. The technical planning is done depending upon the site of lesion and main structures in that region. Referring to the other reported literature, the radical excision of the low flow malformations will give a cure with fine aesthetic result.

## Conclusion

Early resection of low flow vascular malformations give better cure rate with good cosmetic correction and functional achievement.

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# Crush Injuries of Hand in Rural Kerala-Protocol Based Treatment: An Analysis of a Series

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**Abstract**

Kerala state of India is producing large quantities of natural rubber and crump rubber industries and foam making industries are very common. Similarly wood industries and brick makingmachineries are commonly used in Kerala. These are producing large number of hand injuries to such an extend that may times it is impossible for complete recovery. This is a major issue in common man's life and this article tries to study the matter and suggest for a protocol-based management of major hand injuries in view of the manual laborers. We have studied 232 cases of various grades of injuries during 3 yr. period and analyzed the various aspects of treatment and suggest the protocol. The cases other than the industrial injuries are also included in study for comparison.

**Keywords:** Crush Injury Hand; Rubber Industries; Planner Machine; Flaps; Amputations; Reconstruction.

## Introduction

Kerala state in India is one of the world's largest natural rubber producing areas. The crump rubber processing isa small-scale industry in Kerala (Figure 4,5). The geographic pattern contributes for the injuries of hand due to other works like wood industries and quarries. The chance of crush injuries of hand is very high in these situations. This topic was not much discussed any where and we are coming across such extensive crush injuries of hand in the central Travancore. Management of such injuries with poor functional results and cosmetic appearance followingthe reconstruction made this a challenge in trauma care in this state.

Even with the use of micro vascular repairs the salvage of such injuries is very difficult and end resultare poor. The number of patients come with such injuries is very high but the statistical data is lacking. The main causes of injuries in our state are the rubber crushing machine (Figure 3,5), quarries, cement mixing machine and cement blocks making machines, cracker blasts, domestic injuries and wood and carpentry works. A protocol was prepared after analyzing the past data and followed in our institution. We analyzed 232 cases in a span of 3 yrs. and studied the cause, injuries, surgeries and expenses and loss of economy.

*Observations*

232 cases of major crush injuries of hand for a period of 3yrs were studied retrospectively in traumacare department. The data was analyzed for the age, sex, and extend of injuries, procedures done, and economical loss. This is a major problem in the productive age group of males and affects the economyof the low-income group workers.

The main age group is between 20-40 and constitutes 78% (Table1). The sex ratio (Table2) ind icates the predominance of the male 89.6% who are the earning group in the families and procuring the livelihood. The analysis revealed the highest incidence of mangled hand was due to rubber machinery. The population mainly affected was the young earning people. The domestic injuries are

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mostly females, such as the mixer and grinder injuries.

The types of injuries showed that finger and is talhand injuries were more and loss of hand below the wrist was rare. The minor injuries and limited injuries to fingers were debrided and treated with local flaps. But the major injuries with skin loss were treated with flaps like groin flap. But theugly look and the limited function and repeated surgeries made people, to tally u nhappy and the choice of surgeries were limited. Manuel workers liked to have early return to job with limited amputation and closure of wound. Most of the people underwent flap surgeries were unhappy. The economic burden either t he patient or the owner of the work place is around 40 to 50 thousand and the loss for the family is incalculable but may be up to thousands of rupees and in capacitation. This factor was muchneglected by the health care and the industries (Table 3). The freehands were used to change the mixing rubber and it go tdrawn into the rotating machine and long fingers were first got injured and up to wrist were injured in many cases. Thea vulsion of the skin was very commo n in the fingers and if the bone and tendons were viable, flap cover was used for reconstruction.

**Fig. 1:** Groin flap

**Table 1:** Agewise and cause of injuries Chart 1

| Type of injury | 10-20yrs | 20-30yrs | 30-40yrs | 40-50yrs | 50-60yrs | |
|---|---|---|---|---|---|---|
| Rubber crushing machine | 1 | 42 | 30 | 9 | 0 | 82 |
| Wood planner machine | 0 | 8 | 5 | 4 | 2 | 19 |
| Blast injuries | 2 | 18 | 15 | 4 | 0 | 39 |
| Quarry works | 0 | 0 | 20 | 10 | 3 | 33 |
| Domestic injuries | 4 | 14 | 10 | 4 | 0 | 32 |
| Timber mills | 3 | 6 | 18 | 0 | 0 | 27 |
| | 10 | 88 | 98 | 31 | 5 | 232 |

**Table 2:** Sex wise distributions of cases Chart 2

| Type of Injury | Female | Male | Total |
|---|---|---|---|
| Rubber crushing machine | 4 | 82 | 86 |
| Wood planner machine | | 22 | 22 |
| Blast injuries[with or without burns] | | 44 | 44 |
| Quarry works | | 30 | 30 |
| Domestic inuries like mixer etc. | 20 | | 20 |
| Timber mills | | 30 | 30 |
| | 24 | 208 | 232 |

**Table 3:** Extend of injuries Chart 3

| Extend of hand injury | No of patients |
|---|---|
| Hand upto the wrist | 30 |
| All fingers | 60 |
| Fingers other than thumb | 50 |
| Fingers alone | 62 |
| Mixed injuries | 30 |
| Total | 232 |

**Table 4:** Treatment given and Chart 4

| Type of Operation | No of Cases | Satisfaction | Reason |
|---|---|---|---|
| Amputation | 1 | not satisfied | prosthetic rehabilitation |
| Amputation of 1 or 2 fingers | 80 | satisfied | early work for labourers |
| Amputation of thumb | 24 | satisfied | early work for labourers |
| Groin flap | 35 | most are not satisfied | bulky,ugly appearance and limitation of functions |
| Local repair and dressing | 70 | satisfiactory | useful hand with limited deformity |
| Other flaps | 19 | not satisfied | appearance not good, and functional deficit. |
| Microvascular repairs | 3 | not satisfied | cost, lack of cost effective appearnce and function. |
| | 232 | | |

**Fig. 2:** Mangled hand in rubber industry

**Fig. 3:** Mangled hand in rubber crusher machine

**Fig. 4:** Rubber crusher injury

**Fig. 5:** Debridemnet and primary repair

**Fig. 6:** Crush injury hand

**Fig. 7:** Primary debridement, amputation and closure fo Fig 6

**Fig. 8:** Primary groin flap for ring finger avulsion

**Fig. 9:** Local flap for reconstruction

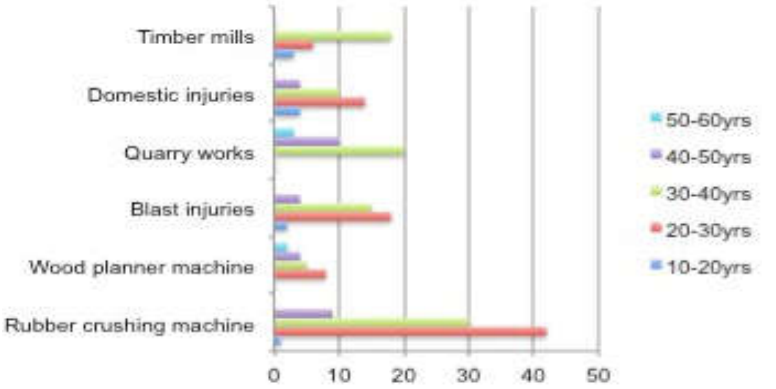


**Chart 1:**

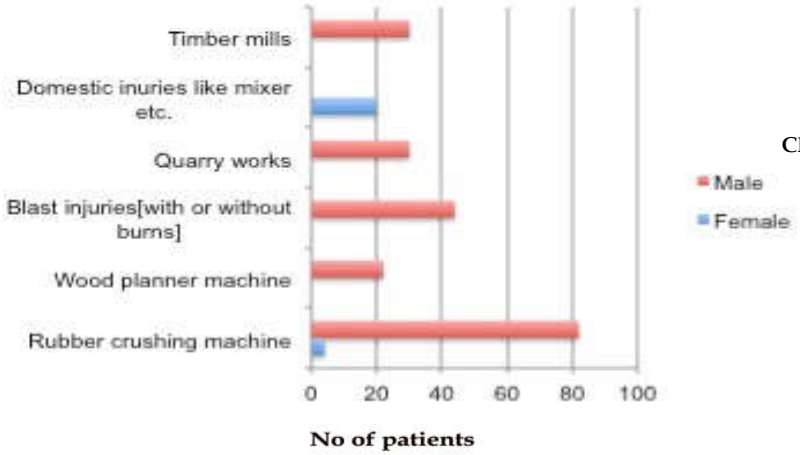


**Chart 2:**

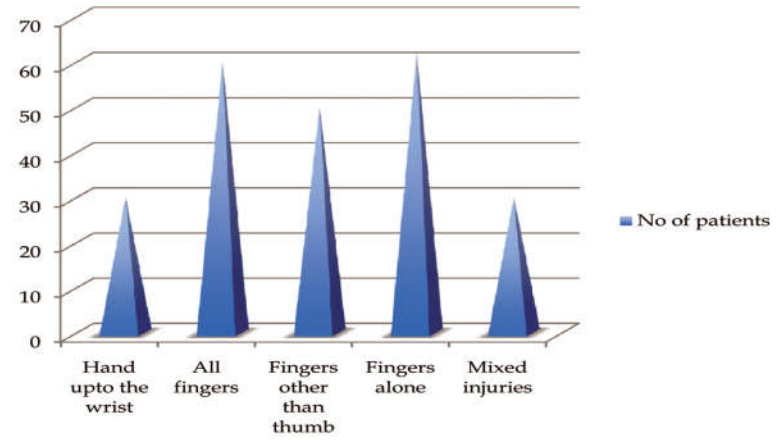


**Chart 3:**

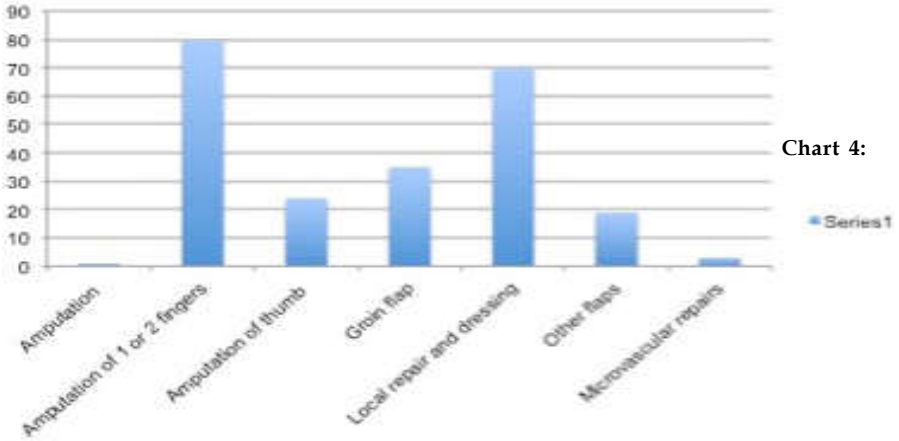


**Chart 4:**

Treatment used (Table4) in the secase sofmangled hand was given in the chart. We go for primary procedures as far as possible and 2n d look operation and procedures are done on 3rd to 5th day.

## Conclusion

A very rarely discussed prob lem of crush injury hand in Kerala produces huge economic and man power loss . The causes are: 1.Alcoholism 2. Prolonged work 3. Poor machinery 4.Poor training and education 5. Profit making attitude of the small scale industrialist avoiding safety measures in the workplace. The main group of people affected is from the most productive group and the functional lossifve ryhigh. The satisfaction of the patient after recon struction is very poor because of the loss of part, functional deficit, or due to the appearancee specially following the flaps. Even though micro vascular surgery has dramatically changed there construct ion, the use is very limited in mangled hands. So also the massive expenses in curred in such procedures is important [1]. The protocol should aim for speedy recovery with limited procedures. The factors that should be considered are:

i. The early return to work.

ii. Limit the amputation of the injured finger s so that the stumps can be used (Figure 6,7).

iii. The psychological

sequel following flaps and revision surgeries for flaps.

iv. Prefer the local flaps than going for distant and microvascular flaps (Figure 9).

*OurProtocol*

i. Early primary debridement/amputation of nonviable parts with local flap closure.

ii. Dirty wounds or those with an in determinant zone of injury are best treated with staged debridement and reconstruction

iii. Second look operation on 3rd to 5th day with or with out flap.

iv. Radical debridement with immediate' emergency coverage' is still controversial.

v. Early mobilization and physiotherapy.

vi. If thumb is not salvageable consider primary pollicization

vii. Amputationproxi maltothe PIP leaves only the in trinsic muscles for flexion. If an amputation proximal to the PIP is required, consider a ray amputation. Ray amputation should be avoided with the index, as it is cosmetically better but it will impair key pinch, power grasp, and pronation strength.

viii. Loss of an isolated digitrarely leads to any functional morbidity [2].

ix. Counseling.

*Treatmentshouldaimat*

a. Precision pinch, Opposition pinch, Esorpulp pinch, Key pinch, Chuck pinch, Hook, Spangrasp, Powergrasp, flath and(Figure 5).

*b.* Minimum four of the above functions should be attained.

c. One should aim for reconstruction of at least the 4 units of the hand

d. At minimum reconstruction should be of an opposing digit and as table post

e. Protective sensation should be regained or retained

f. If the goals of treatment can not be obtained consider amputation

g. Avoid, thick flaps, STSG, and procedures which produces unpleasant appearance of hand (Figure 8)[3,4].

So this type of injuries can better be avoided by giving a dequatee ducation, good protective machinery and fixing the working pattern and time. It is better to go for early limited amputation and local procedures than complicated procedures.

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Case Study

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# 'Lapog Unev' Technique of Unequal Z Plasty for Pilonidal Sinus & Sacral Pressure Sore Surgery: A Novel Technique

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**Abstract**

Pilonidal sinus excision is a common procedure and many forms of flaps like Limberg's flap close the defect. We are introducing a novel technique of "Lapog Unev unequal Zplasty". This is found to be very useful and getting completecure without much scar. The residual scar is deviated from the midline with curvature to lateral side and hence recurrence is nil. Same procedure is used in few cases of pressure sore over the sacrum and found to be very good in healing and pressure bearing property.

**Keywords:** Pilonidal Sinus; LapogUnev Technique; Z-Pasty; Unequal Z-Palsty; Limberg Flap; Sacral Pressure Sore.

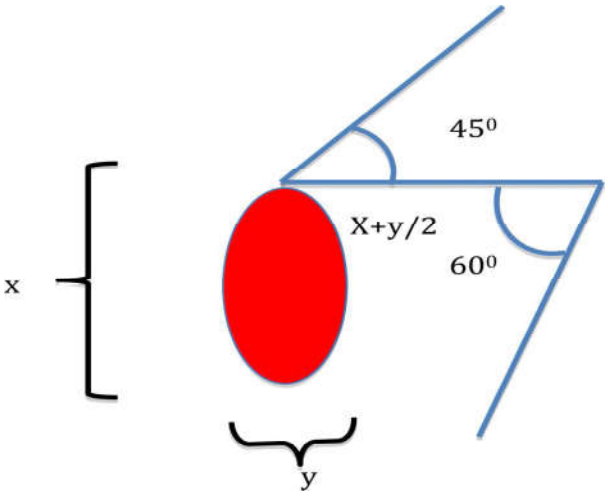
## Introduction

There are many techniques of reconstruction for defects after excision of pilonidal sinus. The commonly used procedures are the rotation flaps, Limberg flaps, Zplasty reconstruction, and semilunar flaps. Each has got its own merits and demerits. We have used technique of varying angle Zplasty for reconstruction of defects after excision of the pilonidal sinus. Making limbs with equal length of the defect at 60 degrees makes the classical Zplasty. The scar will be change to the new direction. Instead of the classical 60 degrees, we have changed the pattern as 60 degrees and 45 degrees. The scar heals away from the midline and the healing is with very good scar.

Similar to the elliptical excision of the pilonidal sinus, sacral pressure sores also can be excised and can be done with tension free closure and better scar and coverage. We have tried this technique in a reasonable number of cases and the results are evaluated.

### *Surgical Technique*

The patients are operatedunder general anesthesia with the prone position. Local infiltration of epinephrine 1:200.000 was followed by excision of the pilonidal sinus with deep tissues creating elliptical or circular excision defect. The finally defect is measured from one end to the other end and noted as ' x'. The horizontal width at the maximum wide area is noted as 'y'. From the upper end of the defect a tangential line is drawn with a length of [x+y/2].

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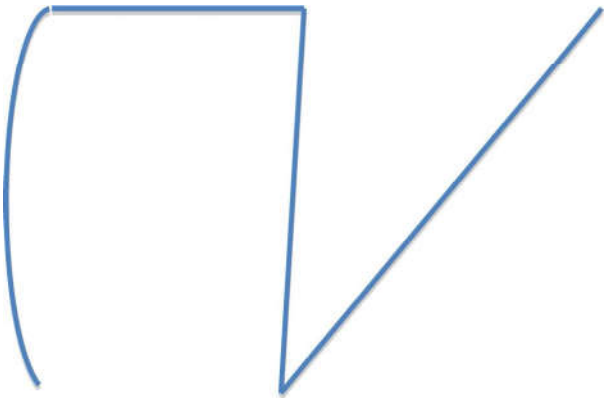
From the tip of this line an oblique line is drawn at angle of 60 degrees downwards with a length of x+ y/2. From the medial end of the line draw another line at 45 degrees with same length. The two skin flaps were elevated as fasciocutaneous flaps and one flap is moved to the defect and the other is transposed to cover the first flap's donor site.



We have done this procedure for 17cases of pilonidal sinus and 3 cases of sacral pressure sores of grade 4.

**Distribution of Cases**

**Fig. 1:** Sacral pressure with exposed bone

**Fig. 2:** Flaps inset in immediate postoperative period

**Fig. 3:** Postoperative after 90 days

**Fig. 4:** Pilonidal abscess drained acute phase with flap design.

**Fig. 5:** Postoperative picture. See the scar is deviated away from the midline

**Table 1:** Age distribution

| | 10-20yrs | 20-30yrs | 30-40yrs | 40-50yrs |
|---|---|---|---|---|
| Pilonidal sinus-elective | + | 5 | 4 | 2 |
| Pilonidal sinus -acute | 3 | 3 | - | - |
| Sacral pressure sore | - | - | - | 3 |

**Table 2:** Time taken for surgery and anesthesia

| Type of Case | Time Taken | Anesthesia |
|---|---|---|
| Pilonidal sinus-elective | 45 to 60 mints | Subarachnoid block |
| Bed sore | 1hr | General anesthesia with prone position. |

**Table 3:** Complications

| Complications | Number of Cases | Cases which had Complications |
|---|---|---|
| Delay in healing | 4 | Acute pilonidal sinus and Pressure sores |
| Flap necrosis | Nil | - |
| Prominent scar after healing | 3 | Mild hypertrophy |

**Fig. 6:** Another case of pilonidal sinus excised with flaps

## Discussion

The surgical procedures for pilonidal sinus excision are wide excision and local advancement flaps, Limberg's flap and other local flaps. They are having some difficulty in complete tension free closure and the scar is very prominent. We have tried an unequal angled Z plasty for the coverage of the resected area and the results are very gratifying. The midline scar is shifted to the side and it is retaining the curvature. The depth of the natal cleft is reduced and hence chance of recurrence is less. The final scar is found to be very thin and no sensory symptoms like itching or hypertrophy seen in statistically significant cases.

The same procedure we have done for sacral pressure sores too and the results are very satisfactory and the healing was better than other flaps.

The bookman's flap was described earlier for pressure sores of 5cms and less and it has a variation of the angle with which the second flap is taken and the measurement is different from our technique.

The follow up of our cases was for 1 year and there was no recurrence. The hypertrophy of scar was seen only in 3cases where there was tendency for hypertrophic scar in them. The delay in flap healing was seen in few cases where we have done this procedure in acute phase. With our experience we recommend this procedure for pilonidal sinus excision and reconstruction. The same procedure is useful for pressure sores in the sacral area too.

## Conclusion

A novel surgical technique we are describing for the treatment of primary repair of pilonidal sinus excision defect and it can be used for the sacral pressure sore too.

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