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Propellar flap: safe, reliable option for coverage of exposed tendo achilles

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ABSTRACT

Background: Stable skin cover over exposed tendo achilles is absolutely essential for proper healing and recovery of tendo achilles function. Exposed tendo achilles can be a result of open injuries, repair of closed TArupture, complications after repair like suture dehiscence, skin necrosis, infection, delayed exposure and recurrent rupture. Various methods have been described for coverage of repaired tendo achilles like distally based skin flaps, advancement flap, free tissue transfers and islanded flaps. This study describes the usefulness of islanded propeller flap for stable skin cover over tendo achilles.
Methods: Over a period of 4 years from March 2012 to August 2016 with total cases were 6, all male patients between 16 to 56 years of age were included in the study. Method of tendo achilles repair/reconstruction was planned, based on individual case requirement. All patients underwent islanded propeller flap for coverage of exposed tendo achilles. All cases were followed up for at least 1 year.
Results: All flaps except one case survived and on follow up the function of tendo achilles was excellent with stable, supple, healthy skin overlying the tendon. Tendoachilles strength was assessed by asking the patient to stand on toes.
Conclusions: Islanded propeller flap cover over tendoachilles provides a stable, reliable, single stage procedure with good aesthetic appearance.

Keywords: Propeller flaps, Tendo achilles cover, Safe and reliable

INTRODUCTION

Stable skin cover over exposed tendo achilles is absolutely essential for proper healing and recovery of tendo achilles function. Exposed tendo achilles can be a result of open injuries, repair of closed TA rupture, complications after repair like suture dehiscence, skin necrosis, infection; delayed exposure and recurrent rupture. Tendo achilles injuries (open and closed) leading to complete disruption of the tendon is commonly seen in developing countries. The diagnosis of closed tendon rupture is made on clinical examination with positive Thompson test.[1] Open TA injuries resulting in exposed tendoachilles may be associated with avulsion of the overlying skin. Such injuries are frequently observed in people using Indian style lavatory pans and accidental slipping in the toilet.[2] Other modes of injury can be direct trauma, two-wheeler accidents etc. Management of tendo achilles injuries involves two critical aspects. First being the repair or reconstruction of the ruptured tendo achilles. Secondly management of the skin overlying the repaired tendo achilles. Primary repair and closure is possible in many cases but that suture line is prone to complications like infection, suture dehiscence, skin necrosis and in long term, extrusion of suture material used to repair the tendo achilles presenting as discharging sinuses around the tendo achilles. Such complicated primary cases, cases

presenting late, recurrent rupture of tendo achilis, delayed exposure of TA and open TA injuries associated with skin avulsion require a flap cover for successful outcomes. Various flaps have been described in literature for cover over TA like distally based skin flaps, advancement flap, free tissue transfers and islanded flaps.[3-11]

The advent of islanded propeller flaps has changed the approach to reconstruction in general. Presence of abundance of perforators in the lower third of the leg arising from the posterior tibial and peroneal vessels is well documented. This study was done to establish the reliability of islanded propeller flaps based on the posterior tibial or peroneal vessels for coverage of defects over TA region and examine if such flaps are an ideal solution to this challenging problem.

METHODS

The study was done over a period of 4 years from March 2012 to August 2016 and included 6 patients. All patients were male in the age group between 16 and 55 yrs. Islanded propeller flap was used to cover the exposed tendo achilles. In all 6 cases both tendo achilles reconstruction (whenever needed) and its cover was done in single stage. Of the 6 cases three were primary with closed TA rupture but delayed presentation, two cases presented with discharging sinuses and secondarily exposed TA and one case was TA contracture post snake bite cellulitis. Tendo achilles integrity was tested clinically by asking the patient to stand on toes and by Thompson test. Complete workup and exclusion of any comorbidities were done before planning for the procedure. Specific investigation like USG and MRI were done to confirm closed rupture and to measure the gap. Post-operative immobilization for 4 weeks and then graduated physiotherapy for 2 months before complete weight bearing at 3 months postoperative period. During the entire 3 months splinting was advised. Follow up regularly for at least 1 year was done. Integrity and strength of tendo achilles was tested by tip to toe standing maneuver.

Table 1: Case details with preoperative findings.

Serial no	Age	Mode of injury	Time of presentation	Tendo achilles findings	Skin defect size
1	45	Slipped from bus	20 days	Closed ta rupture	None
2	42	RTA	8 days	Complete avulsion from calcaneum with gap of 5 cm	None
3	16	Post cellulitis	10 years	TA contracture with foot deformity	Scarring over medial leg
4	55	Fall	1 year	Exposed TA in continuity (Figure 1)	1×0.5 cms
5	25	Fall	2 months	Closed TA rupture	None
6	26	RTA	1 year	Exposed TA	4×7 cms

Table 2: Procedure done, flap type and dimensions and comments.

Serial no	Repair method for TA	Flap based on and size	Complications	Comments
1	Sutured to bone	PTA 10×5 cms	None	Odema prevented primary closure
2	Central part of ta flipped to cover defect	PTA 12×5 cms	None	Nil
3	Z lengthening 7 cms	Peroneal artery based 14×8 cms	None	Scarring over medial leg, hence post tibial not used
4	None	PTA 11×5 cms (Figure 2)	None	Previously repaired TA in continuity with raw area
5	Central part of TA flipped to cover defect	PTA 13×5 cms	Hematoma	Hematoma managed conservatively
6	None	PTA 12×6 cms	Flap necrosis	Severe scarring around the pedicle, insufficient venous drainage

PTA: posterior tibial artery.

Operative procedure

Preoperative planning and assessment of the severity of injury was done. All 6 patients needed flap cover either because of delayed presentation (3 cases), secondarily exposed TA (2 cases) (Figure 1) and skin defect in one case needed TA lengthening (1 case). Tendo achilles repair/reconstruction whenever needed was individualized (Table 2). For the skin cover the choice of propeller flap is posterior tibial artery perforator, for the simple reason that positioning the limb in external rotation is easy and gives good and adequate working

space. Preoperative hand held doppler was used to identify the perforators of posterior tibial and peroneal. Good sized perforator closest to the defect is chosen over which the flap is planned in reverse. The entire procedure is performed under the tourniquet. An exploratory incision is initially made along the medial border of tibia making sure the bone is not exposed. Skin incision is deepenedand deepfascia is also cut. Perforator is identified and confirmation is made for the presence of accompanying veins. Perforator and the venae comitantes are dissected up to the source vessel (Figure 2) with careful dissection making sure no tissues are attached to the pedicle and no injury to the pedicle. Once the pedicle is confirmed, dissected and isolated; the entire circumference of the flap is cut (Figure 3) and raised from the bed so that the only attachment is through the pedicle (Figure 4). The tourniquet at this stage is deflated and the vascularity of the flap is checked and hemostasis done. Twenty minutes time is given for the flap to acclimatize to the perforator blood supply and the venous return. The flap is then turned along the shorter direction and flap inset (Figure 5) done after ensuring that the bleeding from the margins is bright red. Mild venous congestion is expected sometimes but it was seen that it improves over time (obvious venous bleeding is not likely to improve). The donor area is sutured and reduced to the maximum. Rest of the raw area is skin grafted.

Figure 1: Preoperative photo showing skin necrosis with exposed tendo Achilles.

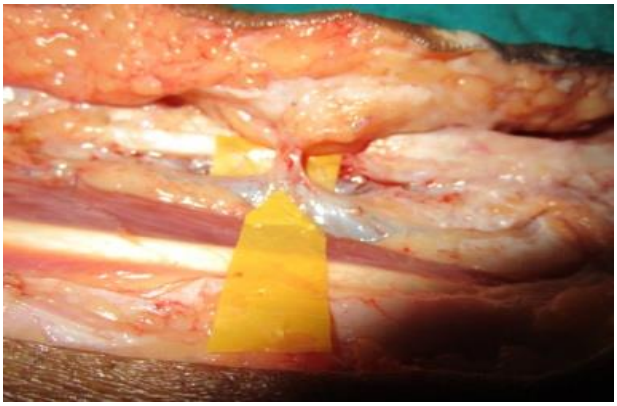

Figure 2: Photo showing the perforator.

Figure 3: Dissected flap based on posterior tibial artery (PTA) perforator of size 11×5 cm.

Figure 4: Islanded flap attached only on the perforator.

Figure 5: Immediate post op after flap inset.

Plaster of paris support is given and loose fluffy dressing is done to avoid compression over the flap. Limb is also positioned in a manner to avoid pressure over the pedicle and elevation post operatively to enhance venous return. Flap monitoring is done routinely and dressings are changed every alternate day. Discharge is planned in a week.

RESULTS

One flap failed among the 6 cases in the study. The cause for impaired venous return and failure of the flap is due to the extensive scarring and fibrosis around the pedicle. Long term results in the rest of the cases were satisfactory. All 5 patients had stable skin over the tendo achilles region with good aesthetic outcome (Figure 6). Strength of the tendo achilles was tested by asking the patient to stand on toes and was found to be excellent (Figure 7). Table I shows the details of each case with preoperative findings. Table II shows the details of the procedure followed including flap size and comments.

Figure 6: One year post op. well settled flap with good aesthetic appearance and stable skin cover.

Figure 7: One year post op with patient standing.

DISCUSSION

Rupture of tendo achilles can be closed and open (compound). Open tendo achilles injury is usually the result of trauma esp. with slipping in toilets and Indian style lavatory.[2] Repair and reconstruction of tendo achilles is done by various methods and various suture materials. TA repair by either primary suturing or reinforcing with local flaps or V-Y gastrocnemius advancement for tendoachilles lengthening have been described in the published data.[12-20] The crux of the problem lies in the vulnerable skin overlying the tendo achilles because the skin over the TA region is tight and has poor blood supply.[21]Although primary repair is possible there is high incidence of suture dehiscence and skin necrosis. Providing a stable skin cover over the repaired tendo achilles is essential for good recovery and optimal functioning of the repaired tendon. Flap cover is ideal in cases of delayed presentation, avulsion injuries, suture dehiscence and skin necrosis and recurrent rupture of tendo achilles. Various flaps have been described including the inferiorly based pedicled flap, reverse sural flap, islanded pedicled flaps, perforator flaps, propeller flaps and free flaps.[3-11,22] Free flaps are suitable for more extensive trauma, major avulsions and long defects, the procedure needs advanced skills, instrumentation, equipment and prolonged operating time. For moderate sized defects and majority of cases local flaps serve the purpose. While choosing a local flap one must consider number of surgeries, stable cover and aesthetics. Considering the drawbacks of pedicled flaps like dog ears, need of secondary procedures like flap division and poor aesthetics; propeller flaps offer the ideal solution. The presence of multiple perforators in the lower third of leg arising from the posterior tibial and peroneal arteries are an added advantage for choosing propeller flaps. In our series our first choice is a posterior tibial artery based perforator because the leg can be externally rotated, the entire procedure can be performed with ease without change of patient position and proper view of surgical field. In one case because of the presence of scarring over the medial side a peroneal perforator was chosen for the propeller flap. Of the 6 cases in this series one flap failed. Chronic inflammation and severely scarred tissues leading to impaired venous return and flap failure could be the cause. It was then managed with skin grafting. Long term follow-up with physiotherapy achieved excellent function of tendo achilles with no complaints of skin necrosis. Patients were satisfied with the aesthetics.

CONCLUSION

Flap cover over the repaired tendo achilles is mandated in secondary rupture, avulsion type of open tendo achilles injuries, primary closure leading to suture dehiscenceor skin necrosis. Local flaps are flaps of choice in moderate size defects and majority of such cases. Posterior tibial artery propeller flaps are first choice for the ease of positioning and surgical access. Caution is advised in presence of chronic inflammation and soft tissue fibrosis. Propeller flaps are the ideal choice in view of a single stage procedure, good aesthetics, and excellent recovery of function of tendo achilles and providing a stable skin cover.

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