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MICROSURGICAL WORK IN BASRAH

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Abstract

Reconstructive microsurgery represents one of the most significant surgical advancement in the second half of the twentieth century. To start such kind of work for the first time in a big city is a great challenge. In this study, we will try to evaluate our work in free flap in Basrah Plastic Surgery unit, and how we manage to start this kind of work in a location and situations not ideal for it. The aim of this study is to evaluate our work (the success and failure) that Basrah center faced in the free flap work and microsurgery, so other centers in Iraq who wish to start this kind of work to benefit from our experience and avoid the mistakes that we had to solve it.

This is a retrospective study of thirteen cases which were done in Al-Sadder teaching hospital in Basrah,Iraq from August 2007 to March 2013. They were 10 males and 3 females, with age range from 4-40 y (median age 17y). In all cases, the lower limb was injuries except in one case where there was scalp loss. In all of the cases Latissimus Dorsi muscle was used as a donor muscle.

Seven out of the 13 cases were successful (54%). In 6 of the cases there was failure due to variety of causes discussed later in detail so as to be avoided in future work.

In conclusion, it is possible to start free flap work in any Plastic Surgery unit if the facilities are available. Team work, proper preoperative evaluation and planning, team decision and equal division of roles are the key points for success.

Introduction

Microsurgery and free flap are the working horse for reconstructive surgery now a day. The history of microsurgery was started by Dr. Susumu Tamai who began experimenting with microvascular surgery in the late 1950s[1]. The first successful free flap operation on human was done in 1970 in California[2].

In most of Iraq (except Baghdad), there were no facilities to start microsurgical work till the end of year 2000.

The use of microsurgical technique will open a wide range of options for solving difficult and complicated reconstructive cases, while reducing the donor site morbidity and give the best aesthetic outcome.

Inspite of all of the advantages which encourage its use, but in fact this kind of surgery is demanding and need many objectives to be accomplished like sound preoperative planning, solid technical skill and diligent patient care in order to get high quality outcomes[1]. A well trained surgeon with good experience in microsurgery, as it needs well trained surgeons to use the microscope and the fine instruments to conduct microsurgery also a multiple teams who are capable of working together to accomplish the work easier and faster.

The lack of familiarity to microsurgery within the hospital staff, OP theater staff and doctors specially the Anesthetist were an obstacle. Free flap surgery is a lengthy surgery that will take at least 4 hours or it may extend up to 10 hours, and this will make inexperienced anesthetist and other co-workers unwilling to participate in such lengthy duty especially long hours of anesthesia. Unfamiliarity of the operative theater nurse was another obstacle that takes time to overcome and get familiar with the procedure, the instruments and the microscope to make the surgery go smoothly and correctly.

Orthopedic team is important in most of the time, as manipulations of the fracture;

fixation devices to the injured limb are required.

All of this coordination and collaboration of the surgical teams, anesthesia teams, and medical staff teams is difficult to obtain and use to produce a successful microsurgical work.

Finally, microvascular surgery in the pediatric cases present special challenges, as the anatomical structures are smaller, vessels are more prone to spasm, and postoperative management is affected by different levels of patient cooperation and insight because of age[1]. To do all of this work in an area that is not used to do it is a challenge.

In this paper, we present our free flap work that had been done in Basrah from 2007-2013 and the evaluation of points of success, difficulties and complications and there causes.

Material and methods

This retrospective study was done in Al Sadder teaching hospital from 2007-2013. Thirteen cases of free flap were performed; all involve the transfer of the Latissimus Dorsi muscle flap from the back of the patients to the lower limb to cover compound comminuted fractures.

Statistical analysis of the data was done by the use of SPSS data Editor Program version 15.

Preoperative evaluation

All of the cases were orthopedic cases with compound and complex fractures in the lower limb, other reconstructive options were unable to solve the problem better than free flaps. Evaluation of the condition of the patient was done in all of the cases by team of Plastic Surgeons, and the kind of procedure to be executed was also decided by the same team.

Generalized evaluation of the patient health and the past medical history and medical clearance was checked. Laboratory test was taken in form of blood count, renal and liver function test.

Chest X-ray and ECG were done and a new limb X-ray was taken as well.

In the last 4 cases and after the availability of CT angiography, arterial angiography was done to the affected limb to see the available vessels and which one is of a suitable size to be the recipient vessel without jeopardizing the limb viability. Prior to that time we were using the colored Doppler for the same purpose.

Lastly anesthetic consultation sometimes was needed to avoid cancellation on the day of surgery as it needs a lot of preparations.

Surgical technique

At the day of surgery and after anesthesia was given through endotracheal intubation, the patient positioned in a Lateral position according to the injured limb and the recipient vessel. The choice of which side Latissimus Dorsi flap to be taken depends on the recipient vessel, if the posterior tibial vessel is needed then the opposite side is choose to be the donor side. While if the anterior tibial vessel is needed the same side will be the donor side for the muscle[3]. After proper positioning, draping and marking, the surgical work is divided in two parts, and two teams working simultaneously, usually two surgeons for harvesting the muscle and one surgeon and a registrar for preparing the recipient vessel.

The first team harvest the Latissimus Dorsi muscle (fig.1) usually taking the whole muscle with special care taken to preserve the feeding vessels to the muscle i.e. long thoracic vessels[4-6].

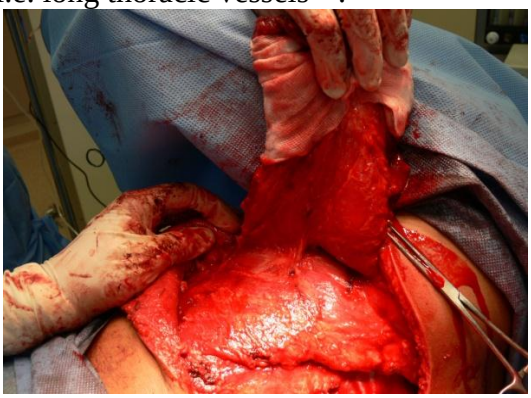

Fig. 1: harvesting of the muscle by the first team

Then the team cut the vessels and secures hemostasis, and start irrigation of the muscular vessels with copious amounts of diluted heprinized saline until the muscle will weep the saline and render pall in color. The second team prepares the recipient vessels (fig.2), dissection start

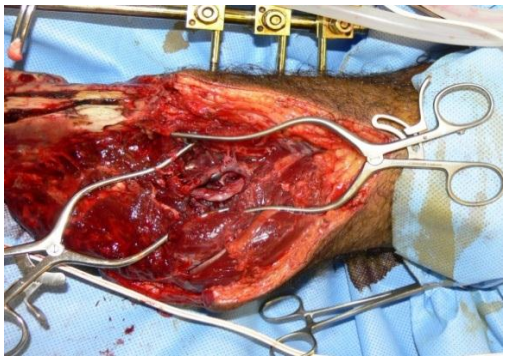

Fig. 2: preparation of the recepiant vessels by the second team

When the recipient vessels are ready, the muscle will be cut and irrigated to reduce the ischemia time. Then the 3rd team stat working to do the anastomosis (fig.3) of

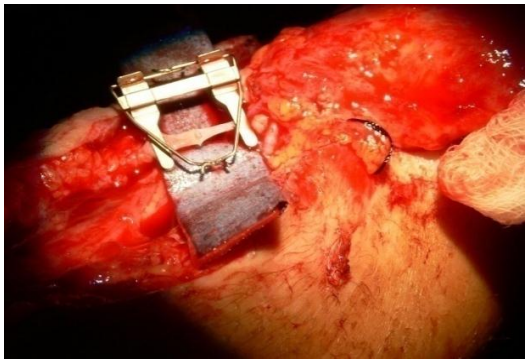

Fig. 3: anastomosis of the vessels by the third team

In some cases, vein anastomosis is done by coupler device. Then test of patency is done to check for the flow of blood through the anastomosis (fig.4)

At the start of anastomosis heparin 5000IU is given IV.

Surgical Doppler 10Hz (Koven technology co,) is used for detection of blood flow in the flap and we determine the best signal area intra operatively.

Then finally fixation of the muscle done, followed by closure and dressing of the wound.

with loop magnification and completed with aid of microscope.

The dissection of the recipient vessels starts from an area free of fibrosis to ease the dissection and get a proper vessel for anastomosis.

The muscle flap to the recipient vessels, usually end to end anastomosis is done to get the best possible chance for survival of the flap as our teams are not so expert to do end to side anastomosis.

In anastomosis the 3rd team use the microscope to do the anastomosis with the proper microsurgical instrument specially the double clamp which should be proper in size and functioning well to avoid problems during anastomosis, we use visibility improvement background from CMG and only 10/0 nylon is used with a needle girth of 100µ for veins and 150µ for arteries.

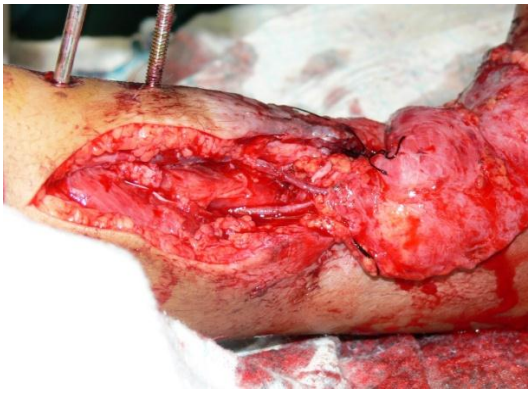

Fig.4: after completion of the anastomosis

Postoperative follow up

The post op. follow up regime include:

- Every 2 hour evaluation of the flap.
-Clinical evaluation of the color of the m. and temperature.
-Doppler signal.
-Cutting of m fibers to see the bleeding.

The patient kept on antibiotics IV for 5 days, Heparin is given 5000IU every 6 hr,

Aspegic IV every 8hr. and maintenance of fluid.

Follow up continue for 5 days then the patient can be discharged home and followed up later as outpatient.

If any abnormality occur the surgeonresponsible for the anastomosis is called and redo is arranged, noting that the microscope and the microvascular instrument set should be available in the emergency room in order to redo the anastomosis outside the working hours.

Results

The age of the patient range from 4-40, with the mean age 17 year. Table I show that 6 cases (about half of the cases) were children below 12 years. Table II show that 4 of the 6 cases that failed were below the age of 12 years.

Ten of the cases were males (77%) and 3 were females (23%).

Most of the cases were lower limb injures, 6 feet and 7 leg with only one scalp (Table III).

The recipient vessel was Posterior tibial vessels in 54% of cases and the Anterior Tibial vessels in 15% of cases.

In all of the cases we used Latissimus Dorsi muscle flap, the LT side in 80% of the cases.

In 7 cases (54%) the anastomosis result were successful, but failure result in 6 cases (46%) (Table IV).

The causes of failure were poor selection of recipient vessel (small artery with insufficient blood supply) in 3 cases 23% of the cases, and in 50% of the failure, the vessels chosen was the suralaa , branch of the popletial aa ,branch of the occipital aa (Table V).

Other causes was poor follow up in one case (7.7%), exposure of the venous anastomosis in a cross leg free flap (7.7%), and ligature of the donor vessels in one case (7.7%)(Table V)

Duration of surgery range from 4-10 hrs with more than 50% above 6 hours (Table VII).

Post operative redo was done in two cases one of them has 2 redoes.

One case show partial necrosis in about 20% of the flap but did not affect the final outcome.

One case of spotty thrombosis with no effect on the outcome.

On average 2-3 cases were done per year, except 2009 and 2013 there was no cases done due to renovation in the operative theater in Al-Sadder Teaching Hospital (Table VI).

Statistical analysis by SPSS software showed no significant relationship between surgical out come and factors like age, sex, site of injury and duration of surgery, which may attribute to small sample size.

Fig. 5: case no.1 showing the injury in the first pic, the second and third pictures show the intraoperative results of flap coverage, fourth pic. show the flap after 2 weeks.

Table I: age & sex cross tabulation

Count		sex		Total
		male	female	
age group	1-12y	3	3	6
	13-25y	4	0	4
	26y-	3	0	3
Total		10	3	13

Table II: success & age group cross tabulation

Count		age group			Total
		1-12y	13–25y	26-	
success	success	2	4	1	7
	failure	4	0	2	6
Total		6	4	3	13

Table III: recipient site & side Cross tabulation

Count		side			Total
		RT	LT		
recipient site	leg	4	2		6
	foot	5	1		6
	scalp	0	0		1
Total		9	3		13

Table IV: success rate

		Frequency	Percent
Valid	success	7	53.8
	failure	6	46.2
	Total	13	100.0

Table V: causes of failure

		Frequency	Valid Percent
Valid	poor vessel selection	3	50.0
	exposure of the vein	1	16.7
	ligature of the vessels	1	16.7
	poor post op follow up	1	16.7
	Total	6	100.0

Table VI: cases per year

		Frequency	Percent
Valid	2007	3	23.1
	2008	3	23.1
	2010	2	15.4
	2011	2	15.4
	2012	2	15.4
	2013	1	7.7
	Total	13	100.0

Table VII: duration of surgery

		Frequency	Valid %	Cumul. %
Valid	4.00	2	16.7	16.7
	6.00	4	33.3	50.0
	7.00	1	8.3	58.3
	8.00	4	33.3	91.7
	10.00	1	8.3	100.0
	Total	12	100.0	

Fig.6: case no. 1 final results

Fig.7: case no. 2 showing the injury and the final results after the flap and graft application.

Fig.8: upper and middle figure show the injury
Lower figure show the viable flap covering the defect before skin grafting.

Fig.9: case no.3 show in the upper image the injure and the middle image the flap inset, lower image show the final results

Discussion

The free flap work is interesting for plastic surgeons as it provide the solution for the hopeless cases.

This study is to show the experience of Basrah plastic surgery unit in starting microsurgical work and to show how the difficulties in this field are overcome.

Microsurgery is not a single surgeon work. It should be a team work for those who are interested in such a kind of work. It's the team work only that can make this achievement possible.

The assisting medical staff should be trained to understand the type of the surgery, why it's so long, and what needed by the surgeon to make the work easier. It took a lot of time until our staff realizes the importance of our work.

Success or failure is a matter of decision and selection, with the progress of work and experience; the team gets more skilled and capable of differentiate between simple and complicated cases. Team decision is the best way for successful surgery. Proper pre op preparation is crucial to avoid failure as the choice of a vessel good size and will not affect the limb viability. The use of colored Doppler

or CT-angiography, will give an Idea about the availability of a proper vessel and its importance to limb viability.

The diameter of the vessel used for anastomosis has become smaller, achieving 98% patency rate in the anastomosis of vessels of 1 mm in diameter is now common[3].

The success rate today is 95.5%-99%, while earlier it was 74% to 91%. Still failure and complication may occur in experienced hands, a technical error can be blamed in many cases but sometimes there is no obvious reason for flap failure[2].

We prefer the use of end to end anastomosis as it gives the best blood flow to the flap beside our experience in end to side anastomosis is not so good. Strict adherence to basic rules during vessel preparation and actual suturing skills will remain the cornerstone for good microsurgical work[3].

Six of the cases done in Basrah were failed, due to the following causes:

One case the surgical team harvests the muscle and ligate the donor vessels.

In three cases (23%), bad selection of available vessel in severely injured limb that was not proper in size or flow.

One case of cross leg flap of cross leg free flap show failure after 3 days when the venous anastomosis became exposed (7.7%); this was due to improper tightening of the external fixation and omitting the application of skin graft on the pedicle as it was planed.

One case show failure due to poor follow up, which was mainly done by resident doctors who have no experience of free flap follow up.

Table II showed that 6 cases were in the age group below 12 years. Four of them had failure (66%) the children are considered among the difficult group for two reasons, first because the vessels size is small and the second is the possibility of having vasospasm[2,3] in the vessels. Both contribute to the failure especially with beginners, so our strategy now is to avoid children as much as possible.

In the age groups above 12 years, there were 5 successful cases and two failures, as the vessel size was comfortable to work with and we usually choose the injured vessel which was the posterior tibial vessels in most of the cases which gave us a good donor vessel.

Intervention to correct poor perfusion and venous thrombosis was done in two cases only, one of these cases needed 2 interventions on the 3rd and 5th post operative days, and both interventions didn't succeed to salvage the flaps, because of the hesitation to redo and the delay in taking action make it fruitless. Salvage rates are most successful within the first 24 hours[7].

Ischemia time is also important factor as any minute increase in ischemia time increase failure rate by 1 %[7]. But in our work we do the arterial anastomosis first to reduce the ischemia time which does not pass 30-60 minutes.

It is necessary, in our country, to emphasize to have the training centers that are adequate equipped, including animal facilities, technicians, microscopes, and microsurgical instruments, to offer training in microsurgery to both residents and practicing plastic surgeons[8]. The training could be carried out using silicone tubes or even pieces of chicken bought from the supermarket[8].

Interested surgeons may also perform this training at home using a magnifying glass because, although a surgical microscope is standard equipment, many surgeons have managed to perform microsurgery with only magnifying glasses, especially when working with free flaps and nerves[8].

Conclusion

To start free flap work in plastic surgery department, a team work is the first thing to be arranged, good microvascular training should be accomplish before entering such field.

Proper preoperative evaluation of the vascularity of the injured limb and the availability of recipient vessels and their

caliber and flow should be checked by colored Doppler or CT-angiography.

Proper preoperative planning of all the details of surgery and dividing the roles equally between the team to reduce their effort and waste of time.

The presence of microsurgical training unit is crucial to refine the skills and improve intraoperative results.

Microsurgery and free flap work is worthy the hard work, and the pleaser of success is long lasting.

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