TRANSFER OF LATISSIMUS DORSI MUSCLE AS MYOCUTANEOUS FLAP

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ABSTRACT

Latissimus dorsi muscle can be transferred as a muscle flap, myocutaneous flap or as a functioning muscle. It can also be used as free muscle or myocutaneous flap. Its long vascular pedicle makes it possible to rotate this muscle through a wide arc of rotation covering neck and upper extremity. It is a large muscle with extensive area and is ideally suited to cover large areas of skin defect. We are reporting eight cases of latissimus dorsi transfer as a myocutaneous flap to cover the skin defects in neck, axilla and upper extremity. Two cases were post-burn and five post-traumatic. One defect was secondary to excision of a large neurofibroma in the area of elbow. Most of the defects at donar sites could be closed primarily. There was only a partial marginal necrosis of transferred tissue in one case. Based upon the knowledge of its vascular anatomy, part of the muscle can be used for transfer which makes the flap less bulky and it can be tailored exactly to the primary defect (JPMA 41: 54, 1991).

INTRODUCTION

The latissimus dorsi muscle is a very versatile muscle for tissue reconstruction. It has become a popular choice for transfer as pedicled muscle for coverage or as functioning muscle, as myocutaneous flap or for free tissue transfer[1-3]. It is a thin flat muscle with large surface area and along 4ependable neurovascular pedicle. It was originally described by Tansini in 1906 but was almost forgotten until Olivari reintroduced it for coverage of radiation defects of anterior chest wall in 1976[4]. Latissimus dorsi muscle is a fan-shaped flat muscle which like other broad muscles of the shoulder has a particularly wide origin. This is usually from spinous processes of the lower six thoracic vertebrae where it is covered by trapezius; from the spinous processes of lumber and sacral vertebrae by an aponeurosis which is part of posterior layer of thoracolumber fascia. Inferiorly it has aponeurotic origin from iliac crest. As the muscle passes upward it receives three or four muscular slips from lower ribs where they interdigitate with the origin of the external oblique muscle of the abdomen. There is an additional slip from the inferior angle of the scapula which joins the deeper surface of the muscle. The fibers of latissimus converge and spiral around the lower border of teres major muscle where it forms the posterior axillary fold. Through a flattened tendon it inserts to the medial wall and floor of the bicipital groove. Here its tendon is closely associated with that of teres major. Nerve to the muscle is thoracodorsal nerve, usually derived from the posterior cord. The nerve passes behind the axiliary artery and joins the vascular pedicle and enters the muscle with the artery. The main blood supply is through the thoracodorsal artery, a terminal branch of sub-scapular artery. Subscapular artery, after its take off from the axillary artery divides into circumflex scapular and thoracodorsal branches. Thoracodorsal artery gives a branch to serratus anterior. Thoracodorsal artery courses along and under the anterior border of latissimus dorsi muscle and enters the deep surface of the muscle at a distance of 8-10 cm from the axilla[1-5]. The vessels and the nerve bifurcate after their entry in the muscle[6,7]. One branch runs along the anterior border about 2cm from its margin. The second branch runs parallel and below the superior border of the muscle. On the basis of this bifurcation one can utilize both or one unit of the muscle for transfer as required by individual case[7]. By using only part of the muscle, one can

leave behind a functional unit of the muscle and it also helps to reduce the bulk of the transferred tissue. There are two venae comitantes with the artery which joins to form a single vein before entering into subscapular vein. The artery is about 1.5-4mm and vein about 3-5mm in diameter. Skin flap may be outlined anywhere on the muscle. Most suitable place is usually over the anterior part of the muscle where perforators are particularly in abundance. Here a large flap can be raised on a narrow strip of the muscle as it will include anterior branch of the artery. We are reporting our experience with the use of latissimus dorsi muscle as myocutaneous flap for skin defects of neck, axilla, upper arm and elbow area.

PATIENTS AND METHODS

Eight cases requiring skin coverage in the area of neck, axilla, upper arm and elbow were operated in B. V. Hospital using latissimus. dorsi myocutaneous flap for coverage. Six cases were male and two females. Average age was 24 years ranging from 8 to 50 years. One defect was in the area of neck (Figure 5), one in axilla (Figure 1)

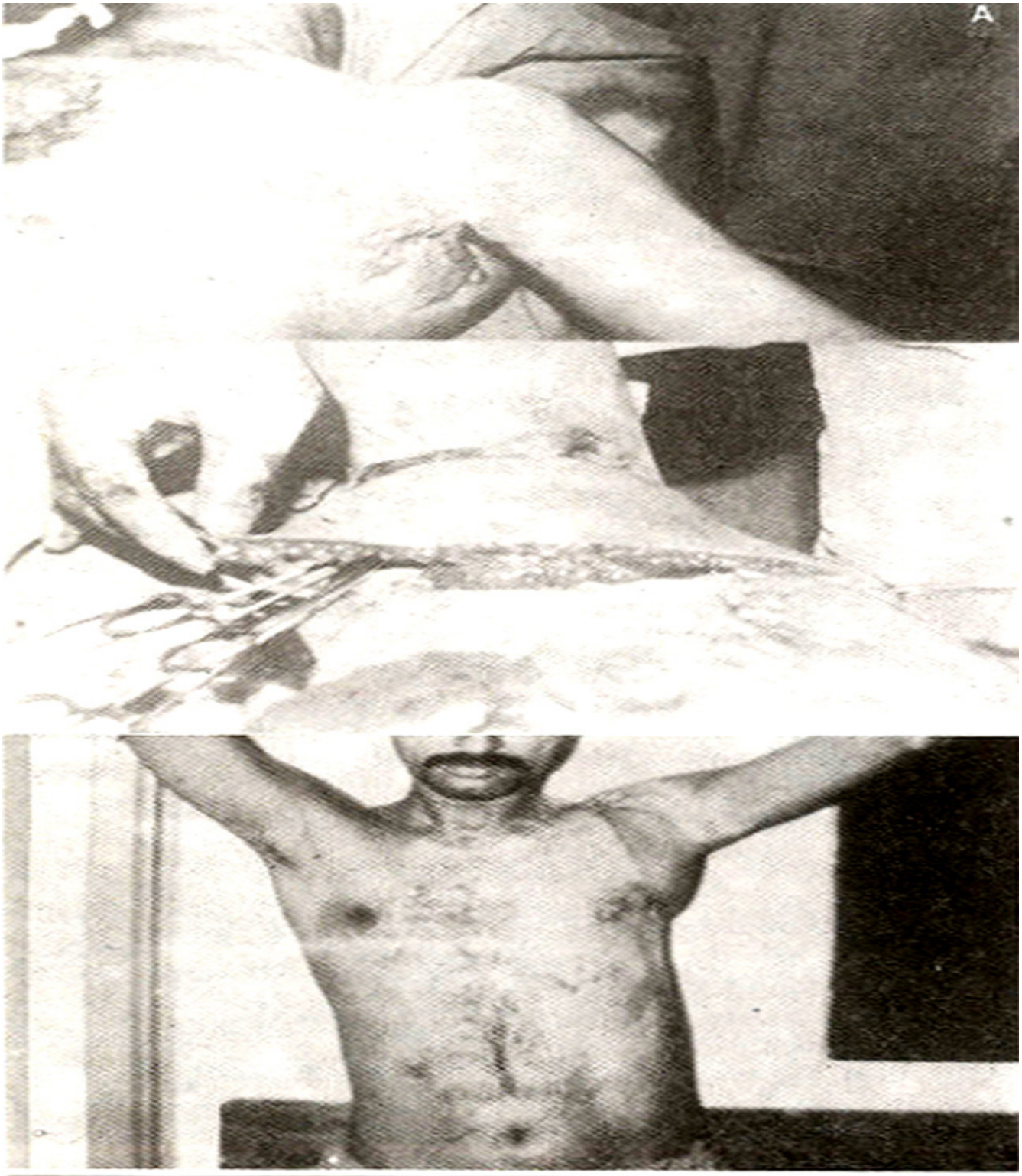

Figure 1. Case 1. Post burn contracture of axilla with severe limitation of movements (a). Transfere of latissimus dorsi flap (b). Improvement in appearance and rangs of motion postoperatively (c).

and six in upper arm and elbow (Figure 2,3,4).

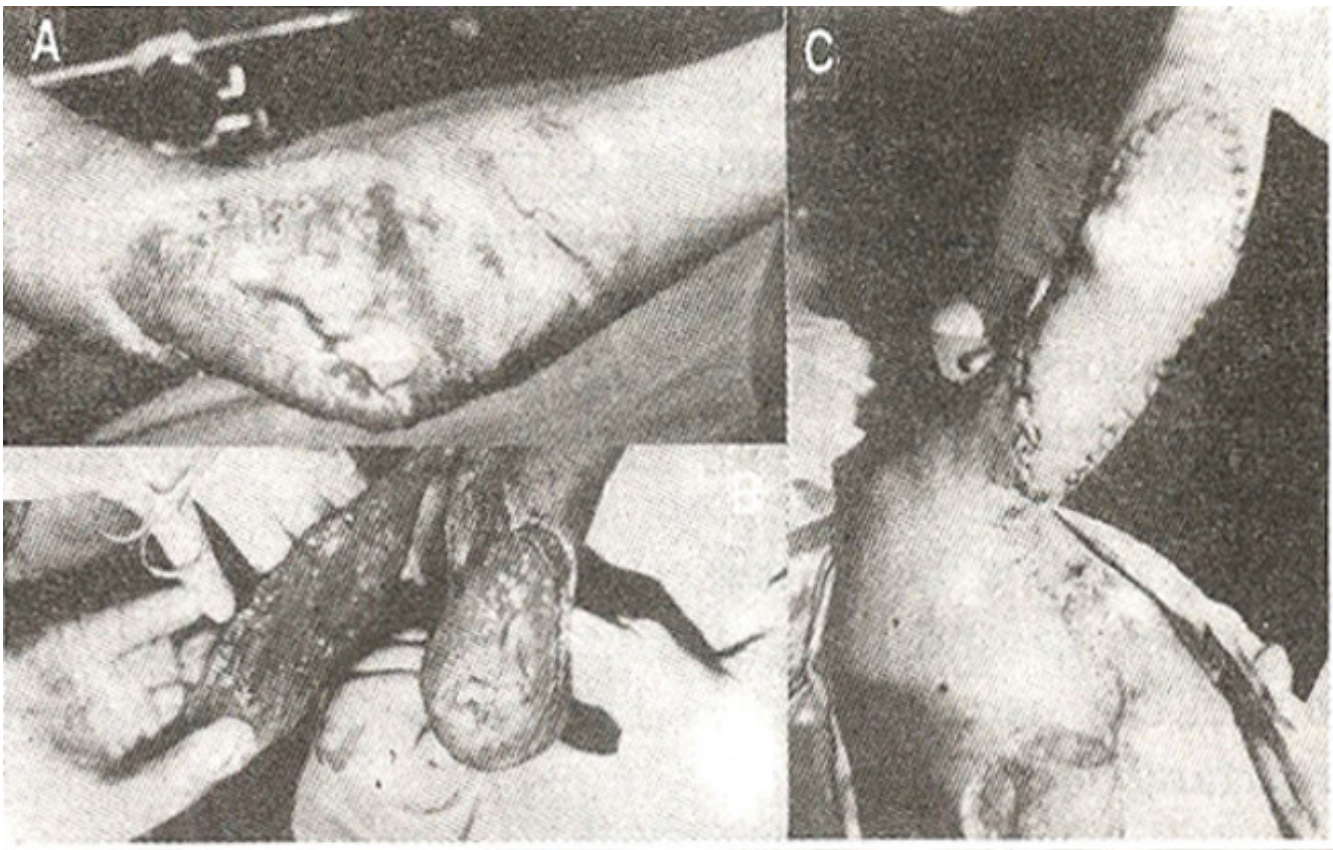

Figure 2. Case 3. Skin loss over upper arm and elbow with fracture of olecranon and exposure of the joint (a). Myocutaneous latissimus dorsi flap is tailored to the defect (b). Adequate of upper arm and elbow (c).

Figure 3. Case 4. Loss of skin and triceps muscle, exposing distal part of upper arm and elbow (a). Latissimus dorsi myocutaneous flap is harvested based upon anterior branch of thoracodorsal artery (b). Coverage of th defect postoperatively (c).

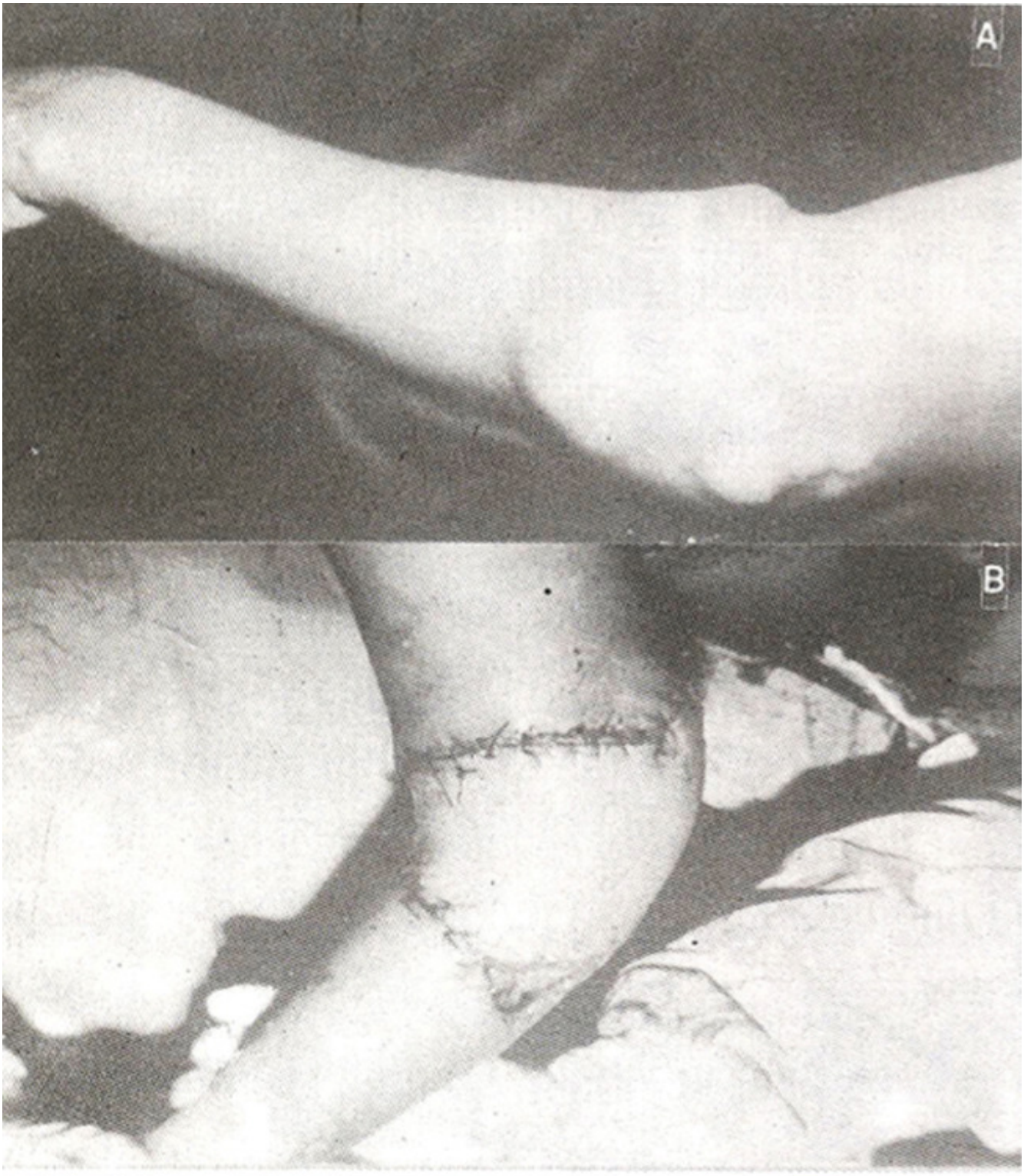

Figure 4. Case 5. Large neurofibroma involving elbow area (a). Coverage of the defect after the excision (b).

In two cases defects were due to post burn contractures (Case 1,6). One case each was due to gun shot wound and excision of large neurofibroma around elbow and four cases were secondary to trauma to upper extremity with skin loss over upper arm and elbow. In all the cases in the upper arm an elbow area neurovascular structures, bone or joint were exposed and defects could not be dealt with split

thickness free grafts. Clinical data is summarised in table.

TABLE . Clinical Data.

Case	Age	Part involved	Mechanism of injury	Associated injuries	Area cm sq
1	29	Axilla	Post burn Contracture	None	250
2	12	Upper arm	Wheel belt ijury	Segmental loss of Humerus, laceration of radial nerve	275
3	8	Upper arm and elbow	Motor vehicle accident	Fracture of olecranon	180
4	30	Upper arm and elbow	Motor vehicle accident.	Loss of portion of triceps.	150
5	50	Elbow	Excision of Neurofibroma.	None	150
6	25	Neck.	Post burn contracture.	None	300
7	27	Elbow.	Gun shot wound.	Faracture of distal humerus.	100
8	35	Elbow and Proximal	Motor vehicle accident	Injury of radial and median nerves	90

Surgical Technique

The surgical technique has been well described before (1.2). Important steps of the technique as practised in this institution are described here. Patient is placed in lateral decubitus position and chest,axilla and arm are scrubbed and draped. The arm is draped free for manouvering during the operation. Excessive abduction of the arm should be avoided, bring the dissection to avoid traction on brachial plexus. Anterior border of the latissimus muscle is marked by drawing a line from posterior auxillary fold of the middle iliac crest. This marks the anterior border of the muscle. Superior border of the muscle is marked by a line from humeral insertion of the muscle to a point 4 cm above the inferior angle of the scapula and continuing to the 6th spinous process. Neurovascular hilum is marked at distance of ten to eleven centimeters from the auxillary artery along the anterior border of the muscle. Using the pattern taken from the recipient tissue defect, cutaneous flap is drawn over any part of the muscle but anterior margin of the muscle is preferred. Incision is made along the border of the muscle and mucutaneous flap. Anterior border of the muscle is identified and muscle is retracted posteriorly in upper part of the incision. At this time part of the vascular pedicle can be visualized. Now the entire cutaneous flap is incised down to the muscle and is tacked to the muscle with few stitches to avoid shearing strain to the perforators. Plane is developed between the muscle and the chest wall using sharp and blunt dissection. Attachments of the muscle to the serratus anterior anä lower three ribs are divided and posterior perforators from intercostal vessels are cauterized. The muscle is divided inferiorly and medially. Now the muscle and skin flap is allowed to fall posteriorly. This brings the neurovascular pedicle in full view. The pedicle is dissected carefully towards the axillary artery and vein. The arterial and venous branches to the serratous anterior and chest are divided and ligated. If needed circumflex scapular vessels can be divided. This will increase the arc of rotation of this island flap. Superiorly the muscle can be divided transversely just above the neurovascular hilum. One does not need to take the

whole muscle in the flap. Where only a narrow strip of the muscle is required, posterior (medial and superior) branch of the thoracodorsal artery can be divided after careful dissection of it within the muscle. This will allow only anterior part of the muscle to be included in the flap, thus reducingits bulk. In this manner the flap can be tailored exactly to the defect (Figure 5).

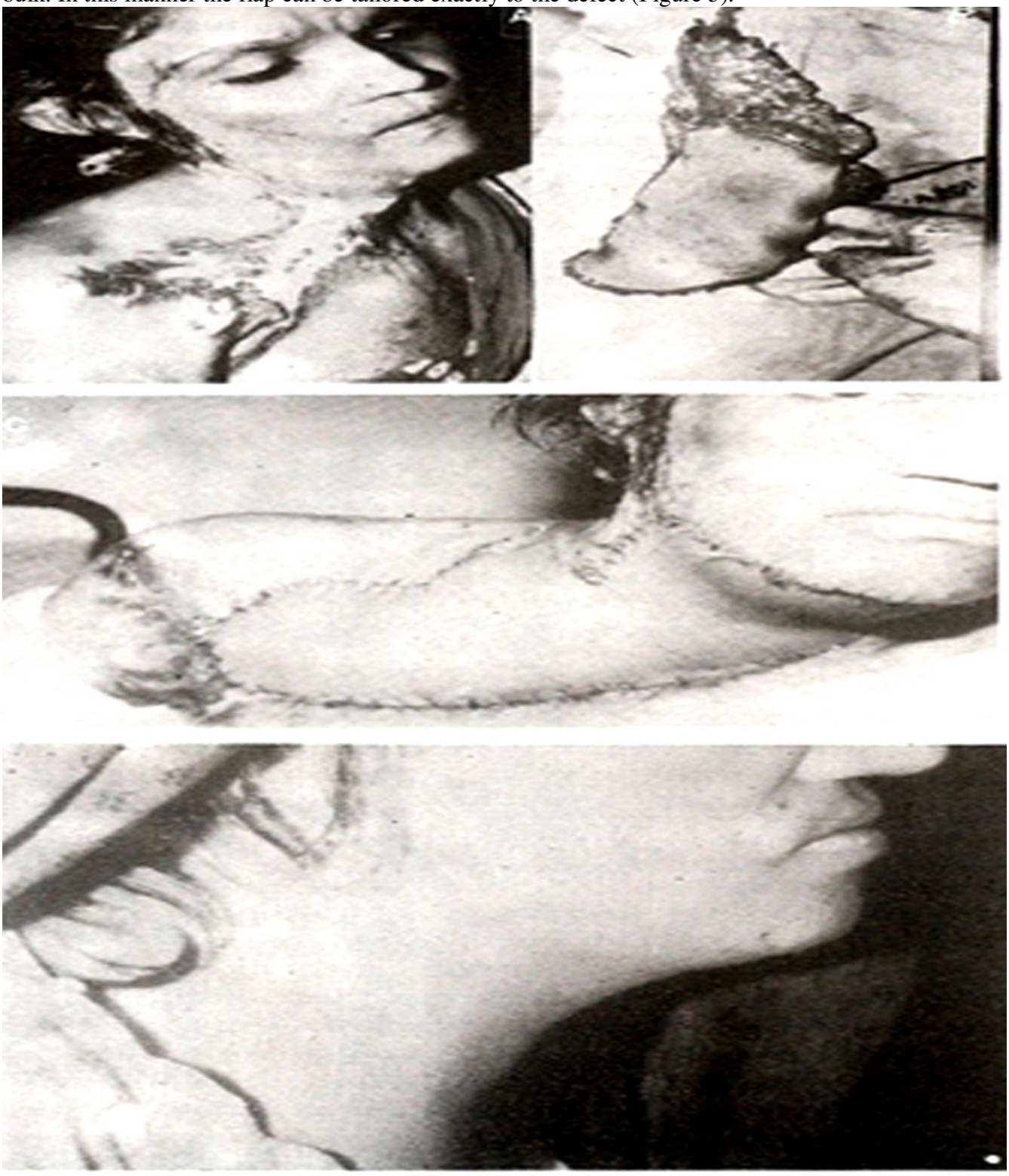

Figure 5. Case 6. Post burn contracture and disfigurement of the neck (a). Tailored myocutaneous latissimus dorsi flap (b). Post operative appearance (c). Final result (d).

If thoracodorsal nerve is carefully splitted and branch to the posterior part can be preserved, a functioning portion of the muscle can be left behind. Now the myocutaneous flap is passed to its destination through the open wound or under an intact skin bridge. The defect can usually be closed primarily with some local rearrangement of the skin.

RESULTS

Primary skin defect could be covered very adequatelyin all the cases. The area of the defect ranged from 150 cm2 to 300 cm2. There was no incidence of necrosis of the flap except only a partial marginal necrosis in one case (8). In this case most distal part of the muscle was used to cover the defect over anterior part of the elbow and proximal forearm. In both cases which were secondary to burn, there was severe restriction of movements of the parts involved. In case 1 where there was contracture of axilla, shoulder could not be abducted more than 50 degrees and it was associated with pain before the operation. Postoperatively, he could abduct his shoulder to 150 degrees easily without discomfort (Figure 1). In case6 with severe involvement of the neck, excellent functional and cosmetic result was achieved (Figure 5). In all the cases involving upper arm and elbow, both objectives of skin coverage and future reconstruction of the underlying structure were achieved (Figure 2,3,4). There was no infection in any case but there was partial dehiscence of the wound over the trunk in one case. The area of dehiscence was covered with split thickness skin.

DISCUSSION

Skin coverage is a frequent problem In neck and upper extremity after burn or severe trauma. There are many methods available to accomplish the task but latissimus muscle, due to its long and reliable vascular pedicle, is a very suitable muscle for transfer. It has a wide arc of rotation and almost any area can be covered in the region of neck, upper extremity and elbow. By using the most distal part of the muscle, part of the proximal forearm can be covered. It has been used as a muscle flap covered with split thickness skin graft (8); or as a myocutaneous composite transfer[3,8,9]. It has great potential to be used for restoration of elbow flexion or extention[10-13]. With availability of microsurgical technique, the muscle can be transferred as free muscle flap, myocutaneous flap or a functioning muscle[14]. Tobin and Barlett has delineated intramuscular vascular anatomy and this allows transfer of only a portion of the muscle. If only anterior portion of the muscle is used, only a strip of three to four centimeters is necessary and it can support skin of much larger dimension. This greatly reduces the bulk and improves the cosmetic result. If branch of the thoracodorsal nerve to posterior part of the muscle is preserved, a functioning unit of the muscle can be left behind. Even transfer of the whole latissimus muscle does not cause significant functional deficit. Latissimus dorsi transfer as myocutaneous island flap has particularly efficient application for coverage of shoulder, upper arm and elbow because the upper extremity needs not be attached to any other part of the body. This avoids any joint stiffness and hastens the rehabilitation of the extremity. Moreover, large areas of skin defects can be easily covered due to very wide surface area of the muscle.

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