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Versatility of free anterolateral thigh flap for head and neck reconstruction

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Abstract

Background and objective: The management of patients with head and neck defects from trauma and tumors (malignant and benign) is challenging, and the choice for reconstructive plan is most significant for better outcome regarding function (such as swallowing and speech), and aesthetic appearance. The anterolateral thigh free flap is one of the commonly used free flaps for reconstruction of complex wounds specially after oncosurgical resection. The objective of the study is to assess the versatility of anterolateral thigh free flap in reconstruction of complex wounds at head and neck.

Methods: Our retrospective study was carried out within five years from 2018 to 2022, in Erbil (the capital of Kurdistan Region, Iraq) at Maryamana and PAR private hospitals. We had ten patients with head and neck defects, and all the operations had been done under general anesthesia, five of them were myo-cutaneous and five were fascio-cutaneous flaps, they remained for about a week at the hospital for follow up and the antiplatelet (aspirin) with the anticoagulant (low molecular weight heparin) had been prescribed to all of them.

Results: Ten patients were included in the study, their mean age (SD) was 54.6 (21.1) years, the age range was 10-84 years, and 60% of them were males. The flap sites were the maxilla (40%), ear and temple (20%), in addition to the other sites. The commonest cause was maxillary cancer in 40% of the patients. All the flaps survived, and only one patient (10%) developed partial skin loss at the recipient site.

Conclusion: The anterolateral free flap has got many advantages and its viability and versatility is very high in management of complex wound defect in different sites of the body and to avoid risks it's better to postpone thinning of the flap at the initial operation.

Keywords: Anterolateral free flap; Complex defect; Head and neck; Microsurgery.

Introduction

The management of patients with head and neck defect from trauma and tumor (malignant and benign) of head and neck is challenging with significant morbidity, and choice for reconstructive plan is most significant for later outcome in regard to function such as swallowing and speech, also the aesthetic appearance.[1,2]

The revolution of free tissue microsurgical reconstruction has become workhorse for complex defects management especially those that associated with big cavity defect or through and through defects after oncosurgical resection, that focus on improvement in function and aesthetic outcome.[3] The anterolateral thigh flap ALT was initially described by Song and his colleagues in 1984.[4,5]

As a septocutaneous perforator flap while in recent studies and anatomical dissections that held revealed that the ALT flap mainly arise on perforators of descending and transverse branches of the lateral circumflex femoral artery which they are musculocutaneous perforator vessels in about (87%) or lateral circumflex femoral artery itself.[5-9] And soon after its discovery

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it became one of the workhorse flaps that used for large complex defects in different sites of the body.[10,11] With the advancement in microsurgery the ALT flap survival ranged (94.0%-97.3%), so that the ALT got many advantages like its good vascularity and long pedicle.[4,12] Can be raised as sensate flap by incorporation of lateral femoral cutaneous nerve in to the flap, muscle can be included to give bulk to obliterate dead space, can be used as pedicle flap for nearby defects, very satisfactory donor site as its mainly closed primarily ,and even two team can work at the same time as patient position would not be necessary.[4]

Our aim is to assess the versatility and viability of ALT free flap in management of defects in head and neck after removal of tumors. And to our knowledge this research has not been done in Kurdistan governorate and Iraq.

Methods

The study design is retrospective study carried out from 2018 to 2022, in Erbil (the capital of Kurdistan region, Iraq) at Maryamana and PAR private hospitals. Ten patients were included in the study, that all of them were complaining from large soft tissue and or bone defects with exposure of vital structures in head and neck that all of them were in need for coverage with flap as it was not possible by direct closure an exclusion of those small or simple defects done that can be managed with other way of coverage or defects at other sites of body, all the cases preoperatively assessed and prepared regarding site, size and investigation in need, and followed up after operation for about six months to one year.

Surgical procedure:

All the cases were prepared for operation and it's been held under general anesthesia in supine position. Marking initiated for ALT free flap as described by Cormack and Lamberty, a straight line is drawn from ASIS to the superior aspect of lateral border of patella ,this determine the intermuscular plane between vastus lateralis and rectus femoris and axial line of the flap ,then at the midpoint of this line marked and a circle of a radius about 6 cm is marked indicating the site at which the primary perforator will be found, then points of about 5 cm proximal and 5 cm distal to the midpoint again marked determine site of other perforators then those perforators are confirmed by Doppler ultrasound probe. Then the designed flap centered on main perforator is marked according to defect size.

Then the incision proceeds medially up to the intermuscular fascia between the rectus femoris and the vastus lateralis identified where the LCFA and its branches are located and the flap raised on either the descending branch mainly or tranverse and main LCF artery as a septocutaneous flap or musculocuneous flap where variable portion of vastus lateralis muscle is included, the pedicle of descending branch of LCFA is dissected up to the branches to the vastus lateralis that this branch should be preserved ,then pedicle divided ,the donor closed primarily and drain left inside, and the inset of the flap done with leaving the suction drain in and dressing done loosely with a window for follow up and patient put on antiplatelet (aspirin) and anticoagulant (LMWH), patient remain at hospital for about 1 week then discharged with instructions and regular follow up.

Statistical analysis:

Categorical were presented in the form of frequencies and percentages. Numerical data were summarized in the form of means and standard deviations.

Results

Ten patients were included in the study, their mean age (SD) was 54.6 (21.1) years, the median was 60 years, and the age range was 10-84 years. Half of the patients were aged 50-69 years, and 60% of them were males (Table 1).

Around half (40%) of the flap sites were the maxilla, ear and temple (20%), in addition

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to the other sites mentioned in Table 2.
The table shows that cancer of the maxilla was the most common cause (40%), and half of the flaps were of fascio-cutaneous type, and the other half of myo-cutaneous type. Regarding the flap survival, it was 100% (Table 2).

Table 1 Age and gender distribution

	No.	%
Age (years)		
< 50	3	(30.0)
50-69	5	(50.0)
≥ 70	2	(20.0)
Mean (SD)	54.6	(21.1)
Gender		
Male	6	(60.0)
Female	4	(40.0)
Total	10	(100.0)

Table 2 Flap site, cause, type and survival

	No.	(%)
Site		
Oral cavity (tongue + floor)	1	(10.0)
Ear and temple	2	(20.0)
Mandible	1	(10.0)
Maxilla	4	(40.0)
Mastoid	1	(10.0)
Left eye + maxilla + skull base	1	(10.0)
Cause		
CA tongue	1	(10.0)
CA ear	2	(20.0)
CA mandible	1	(10.0)
CA maxilla	4	(40.0)
CA mastoid	1	(10.0)
CA left eye	1	(10.0)
Flap type		
Fascio-cutaneous	5	(50.0)
Myo-cutaneous	5	(50.0)
Flap survival		
Yes	10	(100.0)
No	0	(0.0)
Total	10	(100.0)

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None of the patients developed complications in the donor site, while only one patient (10%) developed partial skin loss at the recipient site. Direct closure was the commonest closure method of donor site (90%) followed by skin graft closure (10%). Fascial artery and vein were used in 60% of cases as recipient vessels, and the superior thyroid artery and vein were used in 40% of cases (Table 3). The cases are shown in Figure 1 to 4.

Table 3 Operation details and complications

	No.	%
Donor site complication		
Yes	0	0.0
No	10	100.0
Donor site closure		
Direct closure	9	90.0
Skin graft closure	1	10.0
Recipient site complication		
Yes (Partial skin loss)	1	10.0
No	9	90.0
Recipient vessel used		
Fascial artery and vein	6	60.0
Superior thyroid artery and vein	4	40.0
Total	10	100.0

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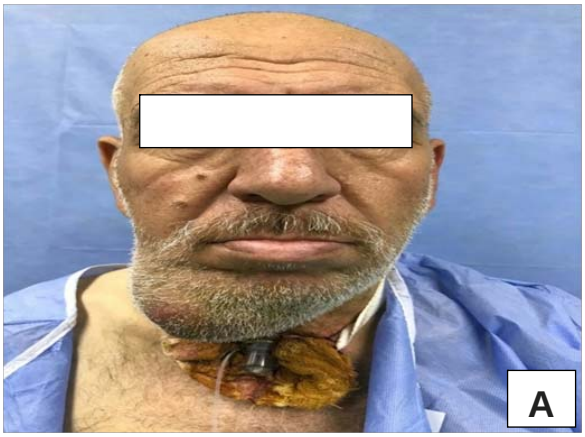

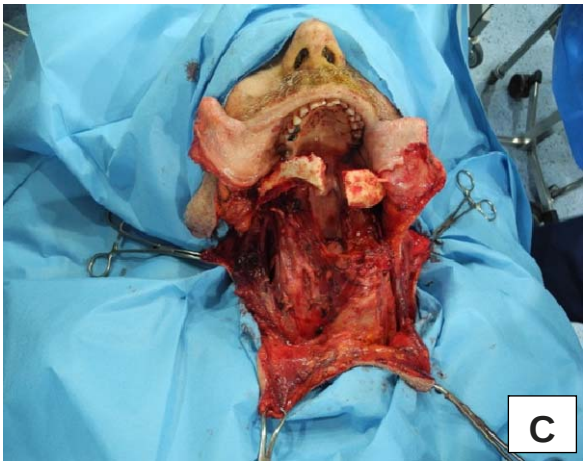

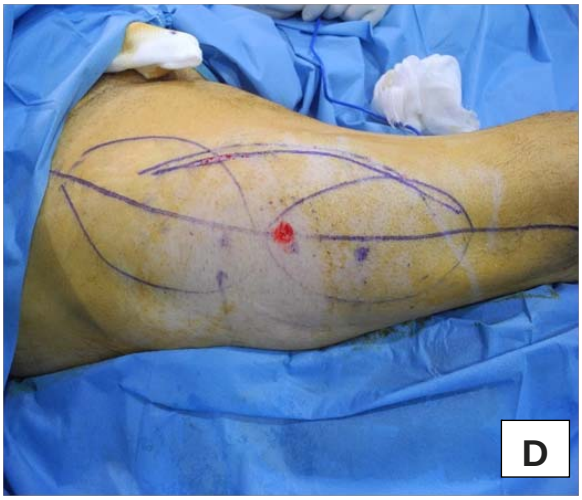

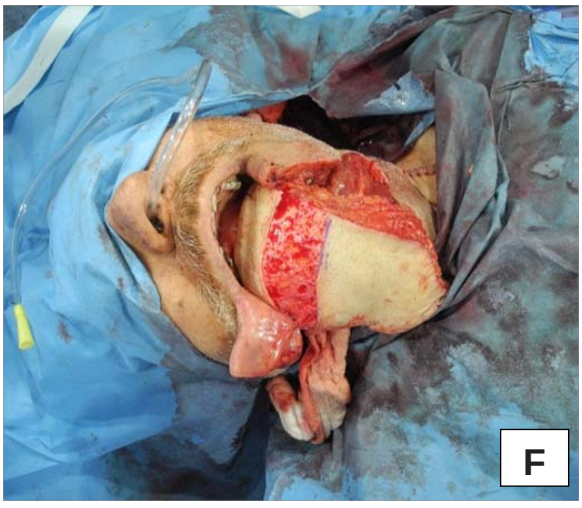

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Figure 1 A (70) years old male with cancer of tongue involving the flour of the mouth and right submental area**. A** and **B**, tumor of tongue and involving floor of mouth and swelling of right submental area. **C**, total glossectomy with partial mandibular removal and neck clearance. **D,** marking plan for ALT free flap. **E,** myocutaneous ALT flap harvesting, **F**, inset and design of flap done in a way to cover and reconstruct the tongue and floor of mouth. **G**, in this flap the motor branch of vastus lateralis nerve been included and cooptation done with hypoglossal nerve. **H** and **I**, the completion of the inset and anastomosis of vessels in submental defect done after then skin closed with leaving a drain in. **J**, final result after 7 months from operation.

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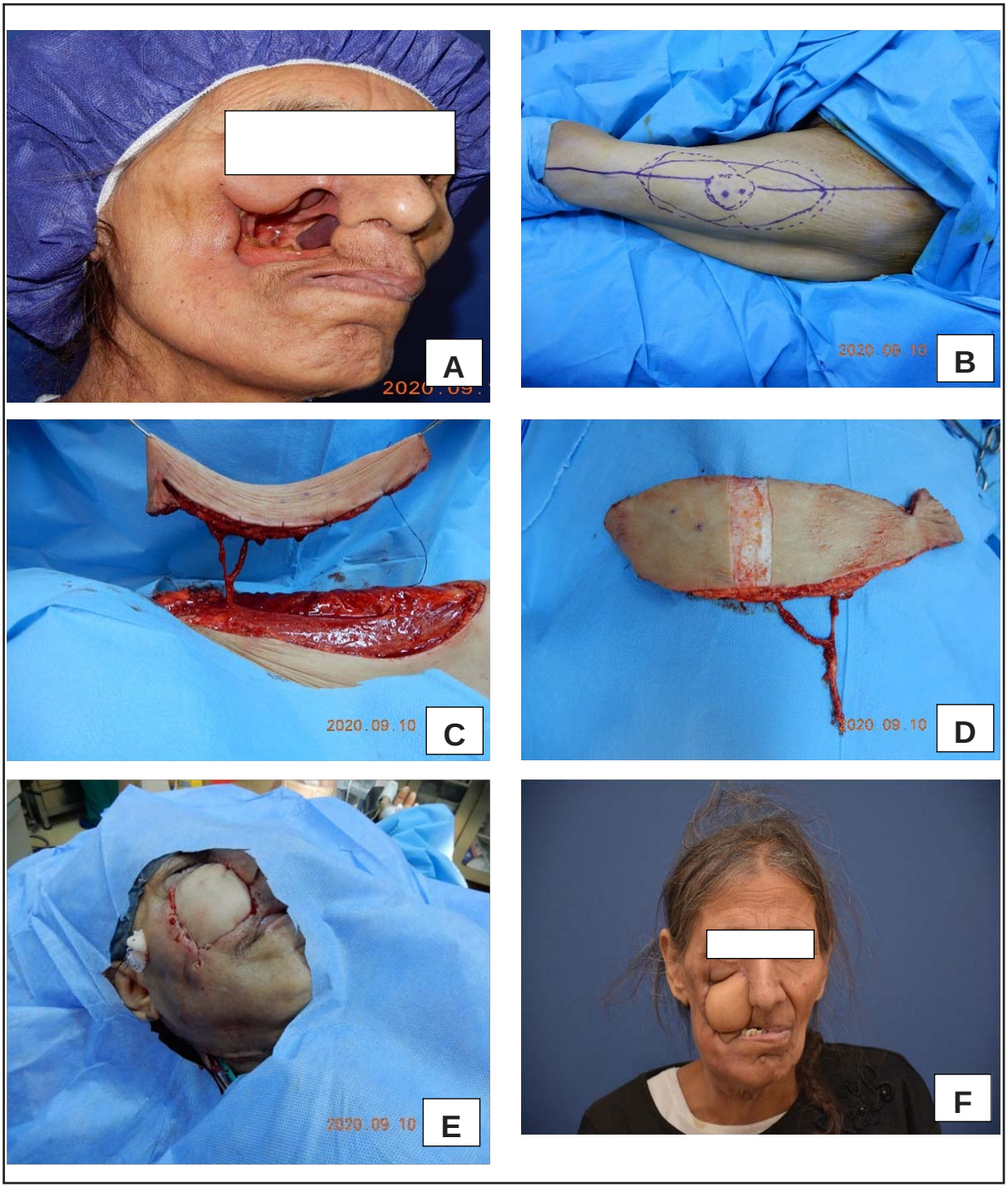

Figure 2 A (58) years old female presented withpost maxillary tumor excision radionecrosis of skin and oral layer defect of cheek area **A**, through and through defect of right cheek area**B**, marking plan for ALT free flap drown. **C,** ALT fasciocutaneous flap raised before division of pedicle.**D**, ALT flap after pedicle division. **E**, inset and coverage of both inner layer and outer skin done. **F**, the result after 4 months from operation.

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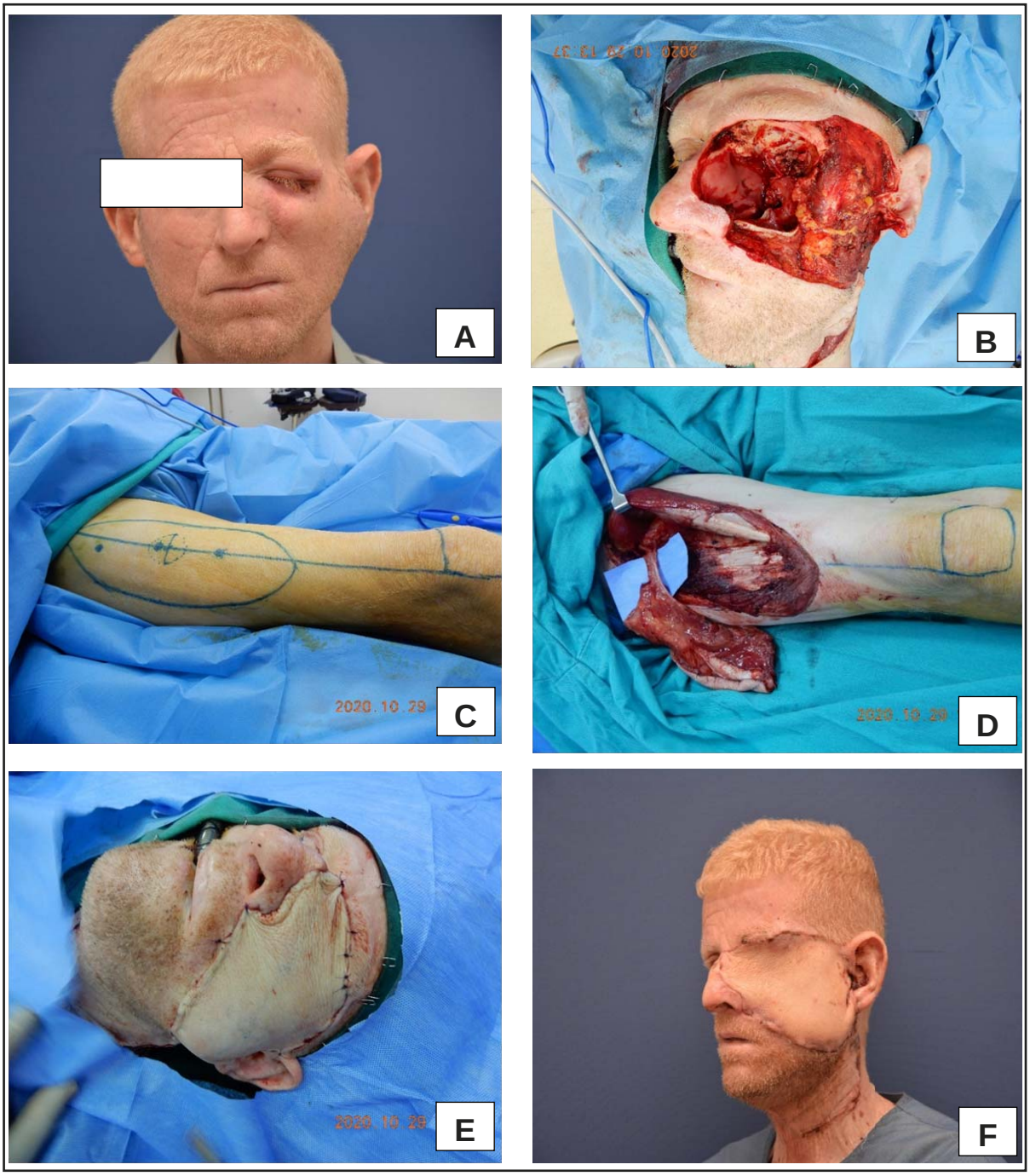

Figure 3 A 54 years old male presented with the cancer of left eye that extended to the maxilla and part of nose. **A**, patient with tumor of left orbital and maxillary extension. **B**, defect after resection of tumor. **C**, shows marking for ALT free flap. **D**, shows the raised fasciocutaneous anterolateral flap with pedicle not devided yet. **E**, inset of the flap to the defect. **F**, result after two months from operation.

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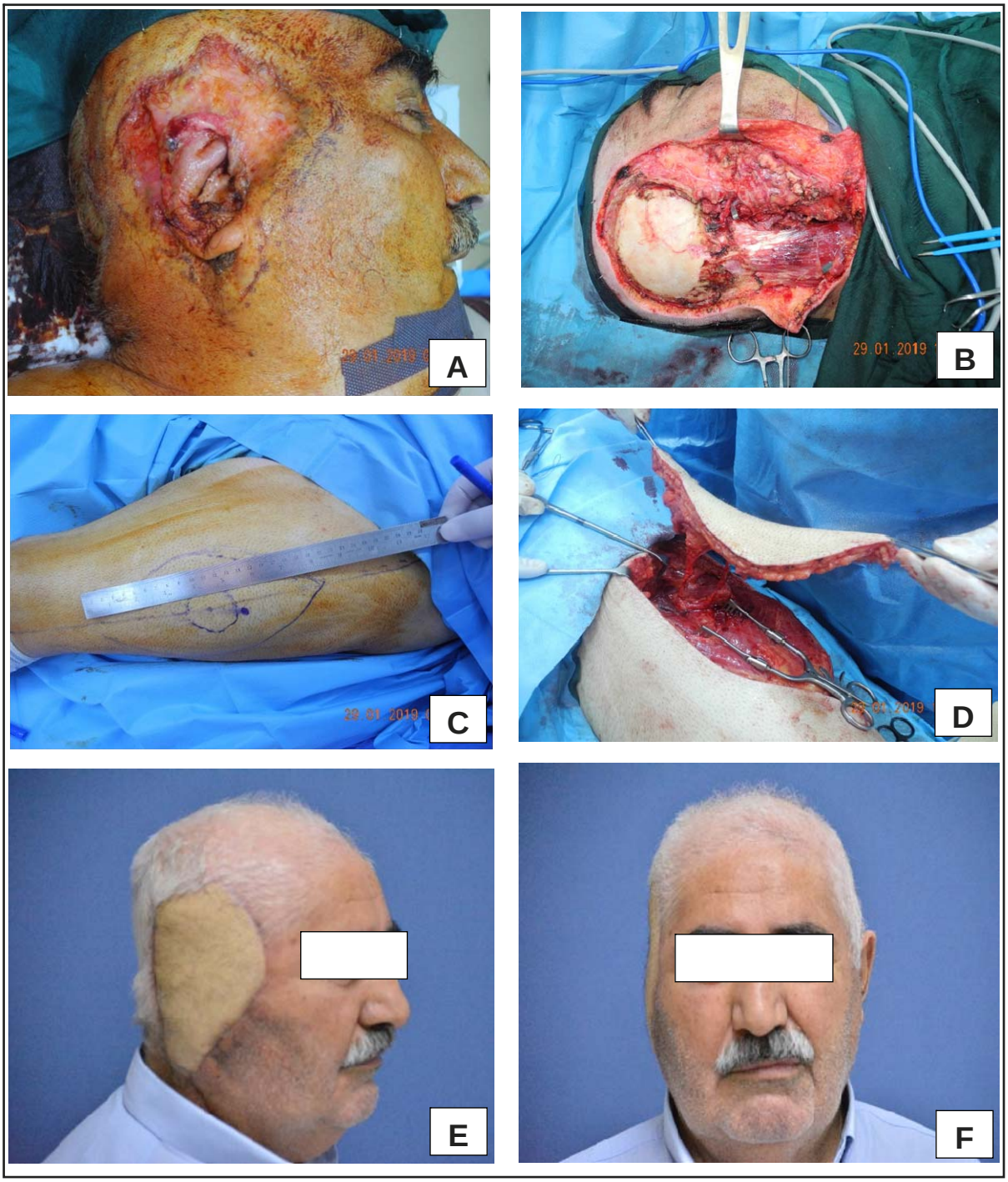

Figure 4 A 65 years old male with basal cell carcinoma of right temple and right ear with invasion to periosteum**. A**, tumor of ear shows extension to surrounding temporal area. **B,** picture shows excision of tumor and ear totally with periosteum of the skull bone and part of temporalis muscle. **C** marking plan for free ALT flap**. D** flap raised and remained by pedicle before division. **E** and F final result after 6 months.

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Discussion

The significance of microsurgical reconstruction of the defects in head and neck is now well established, though to date there is no single flap has considered as the flap of choice for extensive soft tissue defect in head and neck. The ALT flap is well known for its been versatile, moderate thickness and inclusion of muscle bulk provide ideal matches for the head and neck defects.[2]and the free ALT is preferable especially as most oncosurgical resection in head and neck would leave a large cavity defect or through and through defect that need to be obliterated by soft tissue and covered by ideal skin, but loco regional flaps will not give a required bulk and coverage specially after extensive oncosurgical resection.

All surgeons would face the conflict of complex wound management in any area of the body but instant evaluation of wound and systemic condition of patient and possibilities of primary closure orby pedicled flap or free flap closure can protect the vital structured underneath the defect.[4,13]

The main clues for using the ALT free flap in the extensive soft tissue defect in head and neck are glossectomy whether total or subtotal, extensive skull base defects, buccal defect, scalp defects and extensive orbitomaxillofacialdefects.[2,3]

Since the ALT flap discovering buy Song in1984 and popularization as versatile flap in head and neck reconstruction by Koshimaetal, then after many authors have used the ALT flap for different body sites defect and become one of the workhorse flaps in microsurgery.[4]

The ALT flap is formerly described as a perforator flap that can be harvested to include skin onlyor skin and muscle or as a sensate flap by inclusion of lateral cutaneous nerve of thigh; recently described that the main perforator of ALT flap comes from descending branch of lateral circumflex femoral artery as musculocutaneous perforator, this descending branch run through intermuscular space between rectus femoris and vastus lateralis muscles and ends in the vastus lateralis muscle near the knee joint by branching into two to five cutaneous perforators; at the lateral aspect of the thigh majority of perforators exit within 5 cm circle diameter centered at midpoint of the line between the anterior superior iliac rest and super lateral border of the patella and first perforator is the largest one.[14]

Usually there are two veins that comes with descending branch of the LCFA.[4] one vain anastomosis would be enough for venous return but for large sited flap with large amount return one vein may lead to congestion so that two vein anastomosis might be in necessary, and the recipient vessels usually facial artery and vein and superior thyroid artery and vein by end to end anastomosis or sometimes end to side to internal jugular vein, external carotid artery and external jugular vein and for neck depleted vessels (those underwent radiation or redo operation), the transverse cervical vessels would be a good option.[4,14] Though in our cases we have used facial and superior thyroid vessels mainly.

Because the inflammatory response of traumatized tissue will result in the perivascular changes in the blood vessels that can predispose the vessel to thrombus formation at the anastomosis site, that's why the anastomosis should be carried out outside the zone of injury.[14] Though our cases were tumor resected site defects still anastomosis done outside the defect.

The vascular pedicle of free ALT can be up to 8 to 12 CM and this allows anastomosis to be done outside the zone of injury, though, meticulous dissection should be carried out for those long pedicles and even in inset care should be taken not to face kinking or competition and ALT free flap can be harvested as chimeric flap so that two areas would be covered as coverage of oral cavity and the skin on outer surface.[15]

The success rate is excellent in our study

100% and in compare to other studies in different areas success rate is up to 94.0% to 97.3% in general, and its growing and improving with improvement in microsurgery.[14,15]

One of the pitfall of ALT flap is thickness of flap in obese patients, although safety in thinning of flap first mentioned by koshimaet al.[4] Especially if used for hand and foot area, but primary thinning should be avoided for large sized flap to avoid flap failure and we have not done any thinning in primary stage of our flaps to avoid any possible complications luckily all were successful.

Conclusion

We have concluded that ALT is one of the best choices for reconstruction of the complex large defect in the head and neck, that's because of its various advantages like it has long pedicle and robust blood supply, the possibility to be sensate flap, flexibility in volume, style and tissue type, two team work at the same time, satisfied donor site outcome, and the survival rate is perfect up to 100%, if the plan and preparation of patient held under optimum circumstances with avoidance of thinning of flap in initial operation.

Competing interests

The author declares that he has no competing interests.

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