Abstract:
Pressure sore reconstruction has always been a challenge for plastic surgeons due to its recurrence. Traditional local fasciocutaneous musculocutaneous flaps have been associated with high recurrence rate and high morbidity. With the advent of the perforator-based fasciocutaneous flaps, the gluteal artery perforator have become a new and exciting entity with minimum morbidity and multiple options of reconstruction for recurrent problems. This Study was conducted in our institute in patients who were admitted for the sacral pressure sore management due to various causes during the period from May 2012 to May 2013. This study presents a series of 8 cases (5 male, 3 female) of perforator-based fasciocutaneous flaps for sacral pressure sore reconstruction. The flaps were used as a propeller to obliterate the defects. 6 of 8 flaps healed uneventfully without any complications. One patient had a flap that partially necrosed. One case the flap totally necrosed. There was no recurrence during the follow up of 6 months period. We have modified our flap by limiting the dissection to the pedicle. By doing so we can decrease the operative time considerably, reduce blood loss and inadvertent damage to the perforator. It can be even performed by surgeons without micro vascular training. 

Keyword: Sacral pressure sore, Perforator flap, propeller.

Introduction:
Pressure sores, especially in the sacral region, are a common recurring complication in patients who are paraplegic or bed bound. Previously muscle and musculocutaneous flaps have been used successfully in pressure sore coverage before the advent of perforator flaps. They were the first choice for the management of pressure sores, as they provided excellent blood supply and durable coverage. But the disadvantages are limited flap mobility, excessive blood loss during muscle dissection, and the sacrifice of muscle are the major drawbacks of the procedure. In case of recurrence there were very few options available.
The gluteal artery perforator flap overcomes these disadvantages and provides tissue with good vascularity and padding to cover large sacral pressure sores and does not sacrifice the vascularity or innervation of the underlying gluteus maximus muscle. As it preserves the gluteus maximus muscle & the entire contralateral side; they can be used as a future donor site. Another advantage is that there is very minimal blood loss during the procedure. But the main problem with the GAP flap harvesting is that, it requires meticulous dissection of the pedicle, which can be time consuming, tedious, and technique dependent. We modified the flap by limiting the pedicle dissection without skeletonization so that the flap harvesting time is reduced & also possible trauma to vessel by inexperienced micro vascular surgeon. Another advantage is that the flap can be used as a propeller flap, as an advancement flap or transposition flap.

This report presents our experience in successful reconstruction of sacral pressure sores using the gluteal artery perforator flap.

The study was conducted in our department of plastic and reconstructive surgery. Eight patients, five males and three females, were operated upon over a period of 12 months (May 2012 to May 2013). Patients who had undergone previous surgeries in sacral region were excluded from the study. Dimensions of the skin defects and perforators included for all patients are shown in Table 1.

With the patient in prone position, the following landmarks were marked (Fig 1): posterior superior iliac spine (A), greater trochanter (B) & Ischeal tuberosity (D). Lines connecting A & B, A & D were drawn. The junction of the upper and middle thirds of the line AB was marked C. This corresponds to the emergence of the superior gluteal artery from the upper part of the greater sciatic foramen. The middle point (E) of line AD corresponds to emergence of inferior gluteal artery. Using a hand-held

Operative Technique:

Fig 1

Doppler probe, all the perforator vessels around the point C & E were detected and marked on the skin. Perforator close to the pressure sore was selected. Then a Pseudotumour excision of sacral pressure sore was done. According to the resultant sacral defect, the flap was fashioned in an elliptical design including the closest perforator. Incision was made on one border of flap, either superior or inferior border. The skin, subcutaneous tissue and deep fascia were incised. Flap elevation was performed in a subfascial plane. Perforator will be found emerging between the gluteus maximus muscle fibers. Any other suitable encountered perforators may be dissected and included in the flap. Complete skeletonisation of perforator is not done. Once the perforator is identified, incision is made all around the flap, islanding it. Pedicle dissection is performed until the transposing of the flap in to the defect is possible without any kinking or undue tension in the pedicle. Good hemostasis was secured. The flap viability was checked. The Flap was either advanced, transposed or propelled into the sacral defect,
<table>
<thead>
<tr>
<th>S.No</th>
<th>Age</th>
<th>Diagnosis</th>
<th>Defect Size(cm)</th>
<th>Flap Size(cm)</th>
<th>Rotation Degree</th>
<th>Perforator(s) Included</th>
<th>Operative Time (min)</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50/M</td>
<td>Grade 4 sacral pressure sore, # femur &amp; humerus</td>
<td>11 x 5</td>
<td>12 x 6</td>
<td>120</td>
<td>1</td>
<td>50</td>
<td>Nil</td>
</tr>
<tr>
<td>2</td>
<td>37/F</td>
<td>Grade 4 pressure sore, paraplegia</td>
<td>9 x 6</td>
<td>10 x 6.5</td>
<td>130</td>
<td>2</td>
<td>55</td>
<td>Total Necrosis</td>
</tr>
<tr>
<td>3</td>
<td>13/F</td>
<td>Meningo myelocoele with paraplebia</td>
<td>8 x 5</td>
<td>9 x 6</td>
<td>180</td>
<td>1</td>
<td>50</td>
<td>Nil</td>
</tr>
<tr>
<td>4</td>
<td>45/M</td>
<td>Grade 4 pressure sore, paraplegia</td>
<td>12 x 7</td>
<td>13 x 7.5</td>
<td>120</td>
<td>1</td>
<td>60</td>
<td>Nil</td>
</tr>
<tr>
<td>5</td>
<td>34/M</td>
<td>Grade 4 pressure sore, CVA</td>
<td>7 x 4</td>
<td>8 x 5</td>
<td>120</td>
<td>1</td>
<td>55</td>
<td>Nil</td>
</tr>
<tr>
<td>6</td>
<td>38/M</td>
<td>Grade 4 Pressure sore, Paraplegia</td>
<td>8 x 4</td>
<td>9 x 5</td>
<td>120</td>
<td>2</td>
<td>40</td>
<td>Partial Necrosis</td>
</tr>
<tr>
<td>7</td>
<td>55/M</td>
<td>Grade 4 pressure sore, paraplegia</td>
<td>6 x 5</td>
<td>7 x 5.5</td>
<td>120</td>
<td>1</td>
<td>45</td>
<td>Nil</td>
</tr>
<tr>
<td>8</td>
<td>65/M</td>
<td>Grade 4 pressure sore, Intracranial bleed</td>
<td>6 x 4</td>
<td>7 x 5</td>
<td>180</td>
<td>1</td>
<td>50</td>
<td>Nil</td>
</tr>
</tbody>
</table>
taking care to avoid any twisting, kinking, compression or undue tension on the pedicle. The donor site was closed primarily. Two suction drains were placed, one under the flap and one in the donor area. The patient was maintained in a prone position for 2 weeks after which suture removal and gradual mobilization was allowed.

**Results:**
Eight cases of sacral pressure sore were reconstructed with perforator based flap. The youngest patient was 13yr and oldest patient was 65 yrs. old in our series. Flap dimension was ranging from 7 x 5 cm to 13 x 7.5 cm. The flap included mostly one perforator. In two of our cases two perforators were included as it was very close to the defect and its inclusion didn’t produce a kink when propelled in to the defect. The flap was propelled to the defect up to 180 degree. The mean operative time was 51min (range 45-60min). Six flap survived without any complications. One flap totally necrosed due to damage to the pedicle during dissection in our early case, which was managed with a hatchet flap and one flap partially necrosed that was managed with a rotation flap.

**Case 1:** This patient was a 50 years old male with grade 4 sacral pressure sore due to prolonged immobilization due to fracture femur & humerus. The defect was 10 x 5 cm(Fig 2). A flap of size 11x 6 cm was designed. There were two perforator close to the defect. The Lateral perforator was sacrificed. The flap was propelled through 180 degree. The donor area was closed primarily. The flap settled well without any complication.

**Case 2:** This patient was a 34 years paraplegic patient with grade 4 sacral pressure sore. The defect size was 7 x 4 cm(Fig 3). A flap of size 8 x 5 cm was designed including one parasacral perforator. The flap settled well without any complications.

**Case 3:** This patient was a 50 years bedridden patient with grade 4 sacral pressure sore. The two defects were excised and made in to one defect of size 10x 5cm(Fig 4). A flap of size 12 x 6cm was designed including one perforator. The Flap was propelled to 120 degree. The flap settled well without any complication.

**Case 4:** This patient was a 45 years old paraplegic with grade 4 sacral pressure sore. The defect was 12 x 7cm(Fig 5). A flap of size 13 x 7.5 cm was designed based on single perforator. The donor area was closed primarily. The flap settled well without any complication.
Discussion:
Pressure sores are annoying problem for both patient & the treating surgeons. Preventing these pressure sore from occurring seems to be the best possible way. But in spite of best of efforts, they tend to occur in a paraplegic. When it occurs surgery is the best course of action. There are multiple options for covering pressure sore, like local faciocutaneous flap, muscle & musculocutaenous flaps. Local faciocutaneous flaps like limberg, rotation, V-Y advancement have problems like tension at donor site closure, dehiscence & need for extensive dissection. Though the musculocutaenous flaps provide a robust flap with excellent vascularity & padding, they pose multiple problems. Major muscle & major artery in gluteal region is sacrificed in raising the flap, which is not acceptable in ambulatory patients.

Also due to extensive dissection there is considerable blood loss in raising this flap, which could be detrimental in bedridden patients. Further the flap have very limited mobility. The major problem after using gluteus maximus musculocutaenous flap seem to occur when there is recurrence because there won’t be any local tissue available for further reconstruction. Gluteal artery perforator flap can overcome these disadvantages to some extent. In 1993, Koshima ET al.4 found 20-25 perforators supplying the entire gluteal region and used gluteal perforator flaps to cover sacral pressure sores. These perforator flaps provide a reliable flap with the necessary padding. The flap can be designed as per the defect & it spares the underlying muscle. There is very minimal blood loss when raising this flap. But the main advantage is that there are multiple options available in case of recurrence. The entire contralateral side is preserved which can serve as a future donor site. On the ipsilateral side, the gluteal muscle itself is preserved and all flaps based on the inferior gluteal artery are still possible. Verpale ET al.5 described the use of the SGAP flap to reconstruct a large midline sacral defect. Deeply dissecting the perforator vessel from themuscle should obtain a pedicle length of 8.5-10 cm, giving the flap an impressive mobility and the possibility of covering large defects with a unilateral flap. The problem with this perforator flap is that it requires microsurgical training to dissect around the pedicle. The operative time is also prolonged as pedicle dissection is the rate determining step in perforator flap.6 To overcome these limitations we modified the perforator flaps by limiting the dissection in the pedicle. For a small to medium size defects we can perform the perforator flaps without skeletonization of the perforator. The dissection is done only until easy transposing of the flap into the defect without any tension or kinking of the pedicle. By doing so we can considerable decrease the operative time & can even performed by
surgeons without micro vascular training. The average operative time was 51 min (range 45-60 min). Out of the eight cases we had favorable results in six patients. We tend to use the perforator close to the defect, toward one end of the flap, so that it allows easy rotating of the flap. Multiple perforators restrict the mobility of the flap. Lower the number of perforators easier will be the mobility. Using only one perforator may preserve the viability of the flap. In all the cases donor area were closed primarily without tension. In conclusion gluteal artery perforator flap with limited dissection of pedicle is an excellent flap to cover small to moderate size sacral pressure sore. It can be easily & safely performed with reduced operative time with good results.

References:


