Clinical report

Foreskin for skin grafting: an unthinkable positive aspect

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Background: Penile foreskin is a readily available source of dermis, but it is not often used for skin grafting.

Objective: To report the use of the preputial foreskin as donor for full thickness skin grafting.

Methods: The preputial foreskin was used as donor for skin grafting in 42 Thai boys.

Results: The size of the donor graft obtained varied from 15-50 cm² depending on the patient’s weight and penis size. The grafting was successful in more than 90% of patients. There was less contracture and no limitation of movement when the graft lay over a joint. There were no complications at the donor sites.

Conclusion: The use of the preputial foreskin for skin grafting is practical and effective.

Keywords: Autograft, foreskin, prepuce, skin graft.

The rate of circumcision varies by religion, ethnic tradition, social, and cultural factors. Scientific studies have shown medical benefits of circumcision, including a lower incidence of urinary tract infection (UTI), fewer sexually transmitted diseases (STD) including HIV and genital cancers. However, these data are not sufficient for the American Academy of Pediatrics (AAP) to recommend routine circumcision, though it is strongly recommended in Africa where it was shown to reduce the incidence of HIV transmission [1].

Routine circumcision is not practiced in predominantly Buddhist Thailand and there is an abundance of foreskins that can be used for skin grafting. The authors describe their experience of using foreskins for skin grafting in a retrospective study.

Patients and methods

Skin grafts aimed at substituting superficial defects are recommended in many conditions. Such procedures not only protect the denuded area from further trauma and infection but also shorten the healing time of the wound by the so-called ‘healing by tertiary intention’.

Since April 1989, forty-seven boys required skin graft procedures to cover variable sizes of wounds or denuded areas. After evaluation of the circumcision status, five boys had already been circumcised so they were excluded from the study. Of the 42 boys who were not circumcised, seven had mild to moderate phimosis. The parents of all patients were informed about the possible graft donor sites, the outcome, advantages and disadvantages, possible complications, and risks. The use of prepuce as the donor of choice was proposed to the parents and such recommendation was well accepted without any objections in all potential cases. Then, these 42 boys underwent full thickness autografting using their own preputial foreskin as the donor to cover the lesions needed. In other five boys, prepuce could not be used because of previous circumcision. Three patients underwent split thickness graft taken from the buttock and inner upper thigh, and two patients had full thickness graft taken from the groin area.

The patients in the present study were aged between 2 and 14 years, and weighed from 11 to 52 kg. The condition needing skin grafting comprised of scar contracture released (n=11), reconstruction of syndactyly (n=8), skin necrosis (n=8: three after snake bites and five after severe soft tissue infection needed drainage and debridement), coverage of the injured extremities with traumatic skin loss (n=6), grafting the defect after fasciotomy (n=3), burn granulated wound (n=3), other large granulated tissue area where grafting will shorten the healing time (n=3).
Once skin grafting using preputial foreskin is decided, the recipient area is measured, the foreskin is evaluated, the circumcision plan is done for the maximum size and is assessed whether the graft size will be sufficient. The surgeon should be aware that the size of the preputial foreskin that can be used after dissecting of underlying connective tissue leaving only full thickness skin will be double size of the foreskin resected because the preputial foreskin is the double layer skin with the inner skin layer lied close to the glans penis (Fig. 1). Moreover, about 20% more than the actual measured foreskin can be used because of its high elasticity.

If the donor size is not sufficient, meshing is considered to enlarge the donor graft. Circumcision and grafting will be performed under the same setting.

Preparation of the recipient size according to the underlying condition will be done in chronic wound to ensure the good health of the grafting bed, avoidance of the exposed bone, ligament or joint where the grafting tends to be failure (Fig. 2, 3). Measurement of the denuded area may be done at the time of operation, for example, after releasing of the scar contracture or division of the syndactyly. Circumcision technique aimed at using the foreskin in grafting should be done by separated incision on either side of the double layer prepuce, firstly circumcising the outer foreskin at the level of glans penis. In the case that the calculated foreskin is insufficient for grafting, minimal traction of the skin covering the shaft and glans to ensure the maximum size but enough skin covering the shaft during erection is also needed. Then

Fig. 1 Diagram showing the circumcised foreskin and the unfolding of the two layers of foreskin provided doubled size of foreskin for grafting.

Fig. 2 Burn scar contracture at MP joints of the right ring and little finger (A). The preputial foreskin was used as a full thickness graft after the burn scar contracture was released with large denuded area and tendons exposed (B).
full retraction of the foreskin to expose the whole glans penis is done. Any phimosis or adhesion between the foreskin and glans must be lysed. The inner foreskin is also circumcised just 2-3 mm below the level of corona of glans penis. After foreskins on both sides are circumcised, the dissection of the subcutaneous tissue in between is done, and the large vessels ligated or cauterized. Transection of the circumcised foreskin may be done, but on the ventral side which is shorter than the dorsal side, for easier removal of the foreskin. Both rims of the circumcised skin are re-approximated with either interrupted or continuous suturing. Absorbable suture is more convenient for the postoperative care in children. After completing the circumcision, the resected foreskin with outer and inner fold is then unfolded to become a larger piece. The subcutaneous tissue is easily removed from the skin. This enables a larger graft because of added elasticity and without subcutaneous tissue. The skin of the inner foreskin is a bit thinner and white. The rectangular shape has a wider mid portion, as dorsal foreskin is usually taken more than ventral side because of the normal anatomy of the frenulum attached to the ventral inner foreskin (Fig. 1).

Fig. 3 The preputial foreskin after circumcision (A) grafted over the granulated area resulted from fasciotomy (B). There was less contracture, as observed at one year postoperatively (C).
The ready prepared recipient with clean surface is then covered with the full thickness prepuce graft (Fig. 2). As mentioned before, if the donor graft size is not sufficient, then meshing or tiny multiple relaxing incisions will enlarge the size of the graft. Some of the skin defect will be re-approximated and leave smaller size of denuded area where skin graft is needed (Fig. 3). Classical technique of grafting including securing and immobilizing the graft to the bed of the recipient site, can be performed without any difficulty. Splinting of the grafted sites was done if the grafted area was prone to movement of the adjacent joint. Prophylactic antibiotics are used for five days in the clean cases. Cases with previous preoperative antibiotics for their underlying conditions will be continued with the same antibiotics for seven days.

Results

The average defect size was 20.5±14.7 cm². All the circumcised wounds also healed without any complications. The size of the donor graft obtained varied from 15 to 50 cm², related to the weight and size of the patients and their penis size. Meshing or relaxing incisions was used in 12 patients. Prepuce grafting was successful with more than 90% of the graft taken after seven days. Desquamation was noticed over some area in three cases and later healed. Seroma was observed in four cases and after removal of the seroma, the graft re-adhered to the recipient’s bed and healed. The recipient area all healed within three weeks postoperatively, without the need of dressing or covering. Less contracture was observed due to the full thickness graft’s principle (Fig. 3C). There was no limitation of movement over the joint of the grafted area. Scarring and discoloration of the grafted area was observed in all cases. There was less discoloration in younger children aged less than five years.

The skin graft using the prepuce of foreskin of the penis was successful without leaving any abnormal scarring or noticeable appearance at the donor site, such as hypopigmentation, like other method of harvesting the graft (Fig. 4), except the normal looking circumcised penis.

Discussion

Apart from religious consideration, reason for circumcision by medical doctors is still controversial even though some medical indications have been well accepted [2, 3]. The American Academy of Pediatrics Task Force on Circumcision [1, 4] wrote a policy statement and recommendations, stating that there are potential benefits and risks from circumcision.

The approach to wound care depends on the severity, extension, and site of the wound. Superficial wounds or partial thickness loss of skin in a small areas need only dressing with or without application of topical antibiotics and debridement. Deeper wounds or large full thickness loss of skin or wounds at the area across a joint need more aggressive treatment. The risk of infection and scar contracture lead to limitation of movement and interfering with function of the affected area. Skin autograft is needed in such cases not only for faster healing and less invasive wound infection, but also for smaller risks of scar contracture.

Fig. 4 Hypopigmentation, the common sequele, was shown at the site where split thickness graft was harvested.
In children, there are many causes of extensive loss of skin such as burns and other trauma. There are also some cases where skin defects occur due to fasciotomy, to release tension after massive soft tissue contusion of extremities. Skin necrosis or severe soft tissue infection needs extensive debridement. The same applies to release of scar contracture, congenital anomalies of the extremities or other appendages, syndactyly, or even marked malformed hands and fingers in specific syndrome such as Apert’s syndrome. Surgical correction together with skin grafting leads to better appearance and function. Available skin autograft donor tissues can be harvested from many sites. The buttock area and anterior aspect of thighs are commonly used for partial thickness graft. The donor area usually heals without serious effects but hypopigmentation is usually seen. For full thickness graft, skin at the groin is the most commonly used donor site, cubital and postauricular areas are also considered best for leaving minimal scars at donor sites. However, size is limited and the donor site has potential for wound infection [5].

The use of the preputial foreskin as an alternative donor site is not a new idea. Foreskin has been suggested as a source of skin graft in urethral reconstruction for hypospadias, congenital or acquired penile or urethral abnormalities [6], burn wound coverage [7], burn scar contractures of the extremities [8, 9], skin loss after strap injury [9], syndactyly repair [10], and eyelid resurfacing [11]. Nevertheless, only a few doctors recommend this potential donor for grafting, and many doctors perform unnecessary circumcision. This study showed various abnormalities with successful results using prepuce graft and demonstrated the size of the defects that prepuce could be used to covering.

The advantages of using prepuce as graft donor sites are, 1) normal looking circumcised penis and also the donor site is in a hidden site, 2) the circumcision scar has less tendency of hypertrophic scarring or keloid formation, 3) good results as a full thickness graft with less secondary graft contracture, more flexible graft especially over an area requiring movement i.e., across the joint, 4) absence of hair follicles, 5) a larger size of graft compared to other donor sites. The disadvantages are 1) limited to the male, uncircumcised population, 2) hyperpigmentation is always noted at the reconstructed area and in the exposed area where cosmetics may be needed. However, the skin on the inner side of prepuce tends to have good adaptation and natural color matching.

The authors herein reported a series of using prepuce as a donor for skin grafting with good results in patients whose underlying conditions are commonly found in developing countries. These included skin necrosis after snake bites and severe soft tissue infection. The authors also demonstrated the method for circumcision in order to get the maximum size of graft, which varied from 15-50 cm².

Preputial foreskin of the penis is considered one of the best donor sites for full thickness autograft resulting in a large graft. Circumcision at the donor site is considered as a normal variant rather than abnormality. Nevertheless, routine circumcision without specific indications or religious belief is still widely practiced [1, 12, 13] and limits the use of this procedure.

Conclusion
The human foreskin is a very good potential source for skin grafting, and this may well be an argument against routine circumcision in regions where there is no medical, public health or religious reason to encourage it.

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