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### Early tangential excision with guidance of gentian violet application

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#### Abstract

**Background:** Uses of gentian violet as a marker to determine burn depth, to facilitate early tangential excision.

**Patient and Method:** A prospective study conducted on eighteen burned patients, they were admitted to Burns and Plastic Surgery Hospital in Sulaimani, with deep second and third degree burn, and they underwent early tangential excision with the guidance of gentian violet and grafting. Incisional biopsy was taken from two patients and sent for histopathology, they resulted in staining of dead tissues and preservation of normal tissues.

**Results:** The mean age of the patients was (23.25) years. (77.7%) were with flame burn and (22.3%) were with scald burn. With the use of our method (55.5%) of patients needed one session and (44.5%) of patients needed more than one session of excision and grafting. The mean of excised and grafted area was (9.97%) TBSA. (77.7%) of patients with good graft take (90-100%), (16.6%) of patients with moderate graft take (50-89%), (5.5%) of patients with poor graft take (<50%), with a mean of graft take (84.11). The mean hospital stay of those who required one session was (0.51) day/1% BSAB.

**Conclusion:** Pre-operative gentian violet application enabled us to predict the depth of burn injury easily, while performing early tangential excision, faster wound healing, less scarring, increased graft survival, decrease the overall cost and hospital stay, and diminished intraoperative blood loss appear to be the main advantages of this procedure.

**Keywords:** Burn, injury, intraoperative

#### Introduction

The preferred treatment of deep thermal burns includes early excision and grafting. This approach removes necrotic and inflamed tissues and rapidly promotes physiologic wound closure. Excision of burn Escher removes a principal nidus for bacterial infection and exposes a viable bed for skin grafting. Grafting minimizes fluid loss, reduces metabolic demand, and protects the wound from exposure to infectious organisms. Early excision and grafting have been shown to reduce inflammation, as well as the risks multiorgan failure<sup>[1]</sup>. It was Zora Janzekovic working alone in Yugoslavia in the 1960s, who developed the concept of removing deep second-degree burns by tangential excision<sup>[2]</sup>. One of the most important complications of excision and grafting is incomplete excision<sup>[1]</sup>. Thermal injury can injure the epidermis, a portion of or the entirety of the dermis, as well as subcutaneous tissue. The depth of the burn affects the healing of the wound, and therefore, assessment of burn depth is important for appropriate wound management and, ultimately the decision for operative intervention. A variety of techniques have been described for precise determination of burn depth including fluorescein dyes, ultrasound, laser Doppler, and magnetic resonance imaging. However, none of these methods have proven to be more reliable than the judgment of an experienced burn surgeon<sup>[3]</sup>. In our present clinical study, we have evaluated the reliability of a practical method in which Gentian violet is used for predicting burn depth during the early tangential excision stage. This method consists of the application of Gentian violet over the burned area one day prior to the operation. Gentian violet (or Crystal violet is a dye used as a histological stain and in Gram's method of classifying bacteria) is a dye with anti-bacterial effect against gram positive<sup>[4, 5, 6]</sup>, MRSA<sup>[7, 8, 9]</sup>, gram negative<sup>[10, 11]</sup>, used as a blood additive to prevent transmission of Chagas' disease<sup>[12, 13, 14]</sup>, anti-mycotic activity<sup>[10]</sup>, anti-angiogenic and anti-tumor properties<sup>[15, 16]</sup>.

When used alone, Gentian violet combine with necrotic tissue to stain an eschar or scab. This property may be employed, for example to treat the raw surfaces of burns and ulcers [17]. Gentian violet is actively demethylated by liver microsomes from different animals and is reduced to leucogentian violet by intestinal microflora. Other pathways of Gentian violet metabolism have recently been investigated that involve its oxidative N-demethylation by peroxidases [18].

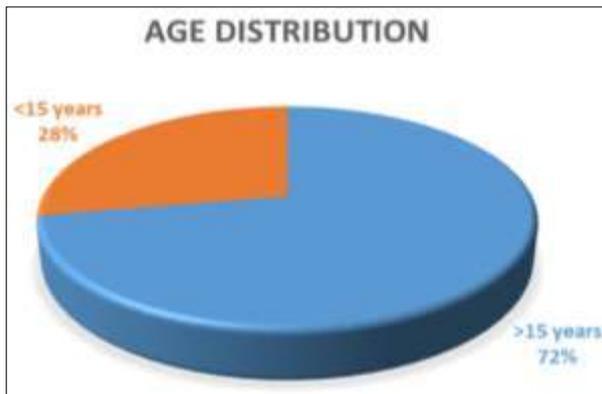
**Patients & methods**

**Study design and setting:** Prospective study carried out in Burns and Plastic Surgery Hospital in Sulaimani for period from April to October, 2015.

**Population study:** All burned patients admitted to Burns and Plastic Surgery Hospital in Sulaimani considered as study population.

**Sampling:** A sample of 18 burned patients with deep 2nd and 3rd degree, were selected from patients admitted to Burns and Plastic Surgery Hospital in Sulaimani.

**Data analysis**



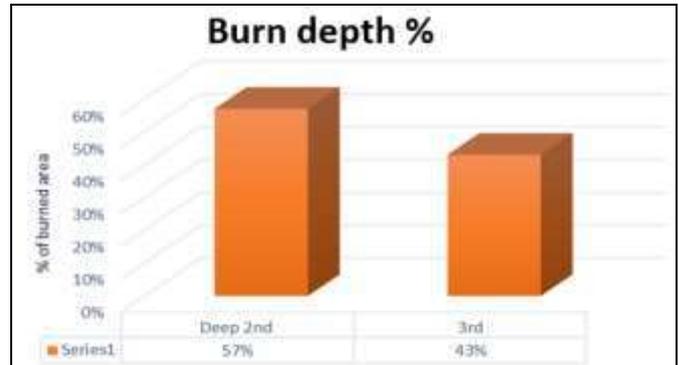
**Fig 1:** Age distribution



**Fig 2:** Gender distribution.



**Fig 3:** Mechanism of burn



**Fig 4:** Burn depth percentage.

The patients were evaluated preoperatively by taking history, clinical examination, and laboratory investigations.

**Surgical procedure:** The burned areas were irrigated with normal saline, then stained with 1% Gentian violet and dressed with Gentian violet impregnated gauze, wrapping the burned area about 24 hours prior to operation time. There was colour variation of the burned area related to variability of necrotic tissue depth in the burned area. During surgery and before excision tourniquet was used in the limbs, and the tumescent technique (dermocleisis), which is sub-Escher adrenaline injection in concentration of (1/1000 000) = one ampule adrenaline in one litre saline, in which [No. of millilitres injected = weight (Kg)/1% B.S.A.] are used as haemostatic's, in areas other than limbs [20]. The stained Escher tissues were excised tangentially by deepening the excision using Watson's knives or electrical dermatome until the unstained tissue reached. After completion of the excision the tourniquet was deflated and bleeding was controlled by gauze impregnated with diluted adrenalin, or electrocautery. It was observed that there was less bleeding, as evidenced by scarcity of bleeding points, compared with conventional excision technique. Autograft procedures were performed to cover the excised areas with meshed graft as shown in (fig.5) followed by conventional dressing with Vaseline-impregnated gauze.



**Fig 5:** Excision and skin graft of the patient



**Fig 6:** 3<sup>rd</sup> post-operative day.

Full thickness Incisional biopsy were taken from query area of two patients and sent for histopathological study, to show if viable tissue was stained or the stain confined to dead (necrotic) tissue. First dressing of SSG usually was done at the third post-operative day as shown in (Fig.6).

## Results

**1. Histological study showed:** Staining of necrotic tissue with preservation of normal tissues.

## 2. The mean graft take

**Table 1:** Mean graft take

Good take SSG 90-100%	Moderate take SSG 50 -89%	Bad take SSG < 50%	Mean graft take	Total number of patient treated by Gentian violet guidance and tangential excision
14 patient	3 patient	1 patient	84.11	18 patient

**3. The mean hospital stay:** The mean hospital stay post-operative was 0.51 day /1% BSA.

4. It was a single session of staining and excision to remove the necrotic tissue from a specific area.

One patient underwent secondary skin grafting because bad graft take in the first session.

## Discussion

The extent and depth of burns are essential determinants of mortality and morbidity following thermal injury. In the our study, histopathologic results show that necrotic tissues stained and the viable tissue free of stain that allow easier excision. Although the mean graft take was 84.11% of an eighteen patients in our study, while the mean graft take in a study done in turkey in 1999 on 42 patient using the methylene blue as guidance for tangential excision was 98% using the same principle In management <sup>[21]</sup>. our study result including complicated cases, one patient with (bad- take category) due to infection leading to partial graft loss, and three patient (moderate-take category) mostly due to missed small areas of dead tissues that prevent the take of skin graft. When we are compare our procedure with a conventional excision performed in our hospital under the same condition and by the same surgeons and team, we get the following advantages:

1. Conservative debridement as normal tissue preserved compared with conventional excision, in which variable amount of normal tissues excised.
2. Less blood loss, as evidenced by scarcity of bleeding points, compared with conventional excision technique.
3. Less experience needed for excision to yield a good take of graft, while in conventional excision good experience is required for successful excision.
4. Shorter operating time to assure (no dead tissues left behind), that time was usually consumed on expense of blood loss from uncovered wound in the conventional way of excision.
5. More economic; less amount of gauze needed for swab. Less total time of hospital stay due to early excision and

grafting.

6. The mean of hospital stay (no. of days) after operation was about 0.51/1% BSAB. In teen patients out of eighteen patient needed *only one session operation* the burned area excised and covered by split thickness skin graft, those patients with BSAB 10, 9, 9.5, 10, 7, 8, 5, 6, 7.5, 8.5% in an average 8.05% BSAB was (3-7 days) in an average 4.84 days.

Also when we are compare the result of our study with a study performed in our hospital by the same surgeon and team under the same condition, using methylene blue as a guidance for tangential excision on a (32) patients, with mean graft take (83.125%) that is meaning, a Gentian violet is equivalent to methylene blue in this point. In our study we didn't face any complication related to Gentian violet such as allergy, irritation, or pain. It to date, no serious side effects have been reported when used externally. However, intravenous injection can cause depression in the white blood cell count. Surprisingly, no acute toxic side effects were reported after administration of large amounts of Gentian violet-treated blood.<sup>18</sup> Limitation of our study, include in complete excision of concave areas and an area between fingers by Watsons knife or dermatome, that's need water jet instrument to excise these specific areas, but it isn't available in our center now. During the application procedure, Gentian violet impregnated gauze was wrapped over the burned area 24 h prior to the operation. It can also be mixed with silver sulphadiazine or other topical burn agents, although impregnated gauze application alone proves easier than other applications.

## Conclusion

Pre-operative Gentian violet application enabled us to predict the depth of burn injury easily while performing early tangential excision, faster wound healing, less scarring, increased graft survival, decrease the overall cost and hospital stay, and diminished intraoperative blood loss appear to be the main advantages of this procedure.

### Recommendation

We therefore highly recommend performing early tangential excision with the guidance, also we recommend the use of a combination of Gentian violet and methylene blue which may extend the action of both materials.

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