V-Y flap vs occlusive dressing for treating fingertip injuries with exposed bone

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Purpose
The aim of this study was to determine the efficacy and the results of occlusive dressing in treating fingertip injuries in comparison with V-Y flaps.

Patients and methods
The study was performed at Orthopedics and Traumatology Department, Assiut University Hospital, enrolling 44 patients with fingertip injuries: 22 patients in whom occlusive dressing was used and 22 patients in whom V-Y flap was done. The Arabic version of the Quick-Disability of Arm, Shoulder, and Hand score, occurrence of complications (infection, nail deformity, stiffness of the distal interphalangeal joint, and necrosis of the flap), time to return to work, finger length pulp volume, and sensory related outcomes (presence of neuroma, two point discrimination measurement, and cold discomfort) were compared between the two groups. The study was approved by Assiut Medical School Ethical Review Board, with approval Number 17100214 and registered at Clinical Trials Database by NCT03193983.

Results
The frequency of nail deformity and neuroma formation was significantly higher in case of V-Y flap in comparison with occlusive dressing group (45.5 vs. 13.6%, $P = 0.04$ for nail deformity; 31.8 vs. 4.5%, $P = 0.04$ for neuroma). Return to the work was significantly earlier in case V-Y flap [6 (4–8) weeks] vs occlusive dressing [9 (6–12) weeks] ($P = 0.01$).

Conclusion
This work showed that both occlusive dressing and V-Y flap are effective methods for treating fingertip injuries. Return to work and duration of treatment were much longer with occlusive dressing than with V-Y flap. Sensory and cosmetic outcomes were better with occlusive dressing than with V-Y flap.

Keywords:
fingertip, occlusive dressing, V-Y flap

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Background

Fingertip is a complex structure that is responsible for the fine functions of the fingers and the whole hand. A fingertip injury is any soft tissue, nail, or bony injury distal to the insertions of the long flexor and extensor tendons of a finger [1].

Fingertip injury is a serious condition, which if untreated properly could lead to significant functional disability and disuse of the injured finger. There is ongoing controversy among hand surgeons regarding the best treatment of fingertip amputations. The main camps are divided between flap closure and secondary healing. The method of treatment is influenced by strongly held beliefs and the history of the training program [2].

The purpose of this study was to determine the efficacy and the results of occlusive dressing in treating fingertip injuries in comparison with V-Y flaps, with much concern to certain factors that are closely related to our locality, including functional outcomes, time to return to work, and its socioeconomic effect and cosmetic results. The study type is a prospective randomized controlled study.

Patients and methods

The study was performed to evaluate V-Y flap vs occlusive dressing for treating fingertip injuries with exposed bone, and all cases fulfilling the inclusion criteria treated in Orthopedics and Traumatology Department at the Assiut University Hospital in the period between May 2017 and May 2018 were included in the study. They were randomized among the two treatment groups selection by serially numbered closed opaque envelopes that contain cards. The study was approved by Assiut Medical School Ethical Review

Board, with approval Number 17100214 and registered at Clinical Trials Database by NCT03193983.

Inclusion criteria

Adult patients aged 18–60 years, of both sexes, diagnosed with fingertip injury with exposed bone (Allen type 2, 3, or 4) in any finger and providing informed consent were included in the study.

Exclusion criteria

Patients with old or complicated fingertip injuries (infection and deformity), patients with nonexposed bone fingertip injury (Allen type 1), patients with severe debilitating diseases (malignant tumors and immunocompromized patient), patients included in other studies, patients with allergy to occlusive dressing material, and patients with defect size more than 1.5 cm^2 were excluded.

Occlusive dressing preparations

The wound and fingers are cleaned with Ringer's or saline to improve the adhesion of the film, if the wound is heavily contaminated antibiotics could be used. For severe bleeding, local pressure bandage and elevation of forearm and hand above heart level for 15–30 min were performed. If this is not enough, a blood pressure cuff is applied to the upper arm at 30 mmHg above the systolic blood pressure while the foil dressing is applied.

Dressing application

Remove the large protective paper on the adhesive side of the bandage foil. The marginal protective paper facilitates holding the film during the first steps. Place the injured finger lengthwise on the foil so that the fingertip comes to lie ~1 cm below the middle.

The distal half of the bandage foil is turned over exactly in the middle in a proximal direction so that a supernatant (reservoir) of about 1 cm remains distal to the fingertip. As far as the individual anatomy and the extent of injury allow, the film should not extend proximally beyond the middle joint to minimize compromise of the mobility of the middle joint. Peel off the second protective paper from the edge of the film. Press the film against the skin proximal to the injury. On both sides of the finger, the palmer and dorsal sides of the foil are pressed together, so that the the film adheres to itself. Peel off the transparent protective film from the outside of the bandage foil. Turning over the lateral 'foil wings.'

To prevent detachment of the proximal edge of the film, wrap a longitudinally doubled, adhesive fixation bandage. In case of still-fresh injury and touch-sensitive wound surfaces, cushion the finger with gauze compresses that are placed lengthwise and circularly. The reservoir at the fingertip must not be compressed.

Finally, attach a finger-tubing bandage with a prefabricated 'fingerling' or a simple tubing bandage in the usual way. Leave the tube as such at twice the length of the finger, and cut the remaining bandage lengthways. The tube is placed twice over the finger. Again split longitudinally the proximal supernatant and fix the division site with a half knot. With the free loops, the bandage is fixed to the wrist (Figs 1 and 2).

Dressing follow-up

The film should not be changed more than once a week so that it can form a favorable environment for regeneration. Even with a tight bandage, an unpleasant odor can come out. Over the wound surface forms a Koagel; this can be occupied completely yellow. This is not pus and should be left. The intact skin is usually softened, wrinkled, and white. Only this area may be cleaned with a compress, soaked in saline or Ringer's solution, and then dried. Then apply a new film dressing in the aforementioned manner.

The V-Y flap technique

A triangular flap is designed with the base at the edge of the amputation and the apex at the distal interphalangeal crease. To mobilize the flap, the fibrous septa, anchoring the skin to deeper structures, are gently divided. To free the deep margin of the flap, the subcutaneous tissue is separated from the periosteum and flexor tendon sheath. The full-thickness skin flap is then advanced over the exposed bone, and the neurovascular bundles are preserved. The base of the triangle is sutured to the nail bed, and the V-shaped donor site defect is closed as a Y.

Follow-up visits were as follows: 2 weeks, 1 month, and 6 months after injury. High-resolution pictures were taken every visit.

Statistical analysis

Data were collected and analyzed using SPSS (Statistical Package for the Social Sciences, version 20; IBM, Armonk, New York, USA). Continuous data were expressed in form of mean ± SD or median (range) whereas nominal data were expressed in the form of frequency (percentage). χ^2-test was used to compare the nominal data of different groups in the study, whereas Mann–Whitney and Kruskal–Wallis tests were used in case of continuous data. *P* value was considered significant if less than 0.05.

Results

The study enrolled 44 patients with fingertip injuries, who were selected randomly by serially numbered closed opaque envelopes that contain cards, dividing them into two groups (Figs. 3–6):

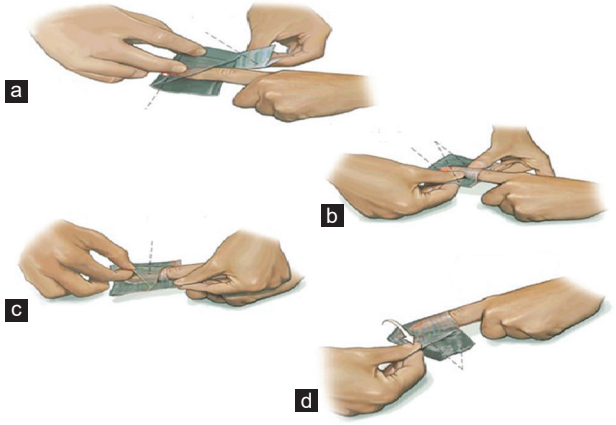
(1) Group I included 22 patients in whom occlusive dressing was used for treating fingertip injuries.
(2) Group II included 22 patients in whom V-Y flap was done for treating fingertip injuries.

The results of the work are summarized in Tables 1–3.

Discussion

Despite a plethora of literature on the subject of management of fingertip injury, comparative studies are few; most of them are retrospective and generally compare conservative methods with surgical procedures. This is the first prospective comparative study comparing between two clear options: occlusive dressings representing conservative treatment and V-Y flap as a surgical line.

Figure 1



Dressing application.

Figure 3

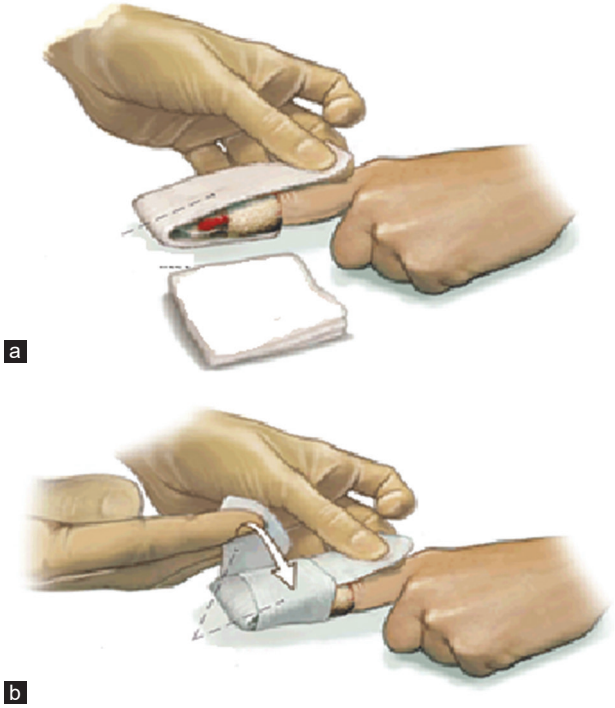
Fingertip injury Lt ring finger.

The primary outcomes were measured by using the Arabic version of the Quick-Disability of Arm, Shoulder, and Hand score which is a reliable, valid, and responsive upper extremity outcome measure for patients whose primary language is Arabic; it can be used to document patient status and outcomes and support evidence-based practice [3].

Many studies reported that occlusive dressing as one of the conservative methods is effective, simple, and suitable for all types of fingertip injuries.

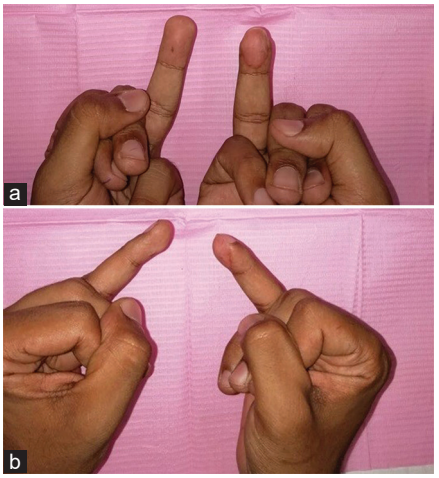
Amer *et al.* [4] reported that the size, location, and involved structures are not critically significant factors

Figure 2



Dressing application.

Figure 4

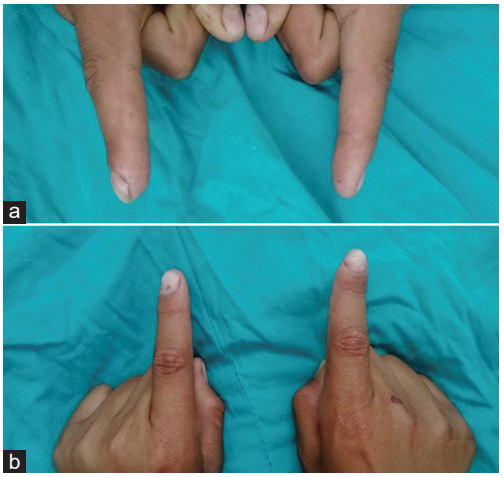


V-Y flap 6 months follow up.

Figure 5

Fingertip injury Rt index finger.

Figure 6



Occlusive dressing 6 month follow up.

Table 1 Demographic data of studied groups

	Occlusive dressing (*n*=22) [*n* (%)]	V-Y flap (*n*=22) [*n* (%)]
Age (years)	29.91±10.54	32.95±13.11
Sex		
Male	17 (77.3)	15 (68.2)
Female	5 (22.7)	7 (31.8)
Allen classification		
Type 2	12 (54.5)	14 (63.6)
Type 3	8 (36.4)	6 (27.3)
Type 4	2 (9.1)	2 (9.1)
Fassler classification		
Transverse	12 (54.5)	13 (59.1)
Volar oblique	7 (31.8)	5 (22.7)
Dorsal oblique	3 (13.6)	4 (18.2)

Table 2 Complications of fingertip injuries in both groups

	Occlusive dressing (*n*=22) [*n* (%)]	V-Y flap (*n*=22) [*n* (%)]	*P*
Nail deformity	3 (13.6)	10 (45.5)	0.04
Limited range of motion of DIP	3 (13.6)	2 (9.1)	0.99
Infection	2 (9.1)	1 (4.5)	0.50
Decrease pulp volume	2 (9.1)	0	0.48
Neuroma	1 (4.5)	7 (31.8)	0.04

in the conservative management of fingertip injuries, and some other authors even go further to the use of conservative treatment in fingertip injuries with small amount of exposed bone that can be cut below the level of surrounding tissue. They also agreed with that fingertip injuries left to heal by secondary intention do so by the process of granulation, wound contraction, and epithelialization. Granulation tissues seem actually to replace lost tissue volume while contraction pulls normally innervated skin over the defect resulting in near normal sensation and reducing the ultimate size of the scar and the newly formed epithelium is relatively normal.

According to Quadlbauer *et al.* [5], the occlusion bandage is a good therapy for all fingertip injuries, regardless of defect level and bone involvement. It is a simple and complication-free therapy that leads to a good result in terms of function, sensitivity, and load capacity of the fingertip.

Many hand surgeons believe that V-Y advancement flaps are simple and have the best results among other surgical methods.

Martin and del Pino [6] in their last review confirm that the results of V-Y advancement flaps are satisfactory.

Lemon *et al.* [7] used the volar V-Y flap (Atasoy) in 22 fingers with a transverse amputation beyond the mid-nail level and dorsal oblique amputations beyond the proximal nail fold with good results.

In this study, the mean age of V-Y flap group was 32.95 ± 13.11 years and 15 (68.2%) of them were males, whereas the mean age of the occlusive dressing group was 29.91 ± 10.54 years, and 17 (77.3%) of them were males.

In the study by Fattah *et al.* [8], the mean age of the patients was 35 years, and males represent 66%, whereas in the study by Amer and colleagues, the mean age of patients was 36.1 years and males represent 68.9%. In the series of Gandhi *et al.* [9] (2016), the mean age of patients was 30 years, and males accounted for 80%.

These data are comparable to our series clearing that the young aged males are active and occupy most of manual occupations, so they are more susceptible to all hand injuries particularly fingertip injuries.

It was noticed that return to the work was significantly earlier in case V-Y flap [6 (4–8) weeks] vs occlusive

Table 3 Outcomes of fingertips injuries in both groups

	Occlusive dressing (*n*=22) [*n* (%)]	V-Y flap (*n*=22) [*n* (%)]	*P*
Abnormal two-point discrimination	2 (9.1)	3 (13.6)	0.50
Necrosis of the flap	-	1 (4.5)	-
Number of dressings	6 (4-8)	-	-
Quick DASH score			0.73
0	8 (36.4)	7 (31.8)	
2.3	10 (45.5)	11 (50)	
4.5	3 (13.6)	4 (18.2)	
6.8	1 (4.5)	0	
Return to work (weeks)	9 (6-12)	6 (4-8)	0.01
Shortening in mm			0.07
No	15 (68.2)	7 (31.8)	
Mild (1-5)	6 (27.3)	12 (54.5)	
Moderate (6-10)	1 (4.5)	1 (4.5)	
Severe (>10)	0	2 (9.1)	
Satisfaction scale			0.14
Strongly satisfied	10 (45.5)	6 (27.3)	
Satisfied	11 (50)	10 (45.5)	
Neutral	1 (4.5)	6 (27.3)	

DASH, Disability of Arm, Shoulder, and Hand.

dressing [9 (6–12) weeks; $P = 0.01$]. This is because the secondary intention in the dressing group takes more time than the primary intention in the flap group.

It was noticed that frequency of nail deformity and neuroma was significantly higher in case of V-Y flap in comparison with occlusive group (45.5 vs. 13.6% for nail deformity and 31.8 vs. 4.5% for neuroma). According to Thoma and Kristine Vartija [10], the distal nail bed may be pulled in the volar direction in injuries treated by V-Y flaps, creating a hook nail deformity.

Vlot *et al*. [11] reported that as the level of fingertip injury becomes more proximal, the incidence of digital nerve injury and neuromas formation increases. Iatrogenic surgical trauma may also play a role in case of V-Y flap group. Previous studies with small sample sizes reported rates of painful neuroma after upper-extremity amputation ranging from 4 to 25% and also a possible association between younger age and the development of painful neuroma. It is known that nerve regeneration is age dependent; that is, younger patients undergo more robust nerve regeneration and therefore may be more likely to form a painful neuroma.

Regarding other outcomes like abnormal two-point discrimination, limited range of motion of distal interphalangeal joint (DIP), infection, decreased pulp volume, and shortening in comparison to contralateral finger and cold intolerance, there was no significant difference between the two groups.

This is comparable to the retrospective analysis by van der Berg *et al*. [12] in which 53 patients with finger joint injuries (Allen II–IV) treated reconstructively (VY plasties, full-thickness skin grafts or local flaps) and conservatively (silver sulfadiazine, wet, and vaseline dressings) were compared. There was no significant difference in sensitivity and cold intolerance between groups.

Limitations of this work were the number of cases, because as it increases, the results become more reliable, and the follow-up period is relatively short (6 months), because with time, sensory abnormalities of fingertip may improve and the need for further surgical intervention is unknown. The late results hopefully need to be considered in another study.

Conclusion

The evidence in this work showed that both occlusive dressing and V-Y flap are effective methods for treating fingertip injuries. Return to work and duration of treatment are much longer with occlusive dressing than with V-Y flap. Sensory and cosmetic outcomes are better with occlusive dressing than with V-Y flap.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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