Fingertip Injuries Treated with Semi-occlusive Dressings

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ABSTRACT

Objective: To demonstrate that semi-occlusive dressings achieve reconstruction of the distal phalanx with no residual pain, no additional shortening, and a satisfactory aesthetic appearance. **Materials and Methods:** 47 fingers with distal injuries were assessed and classified into three groups: a) with skin and subcutaneous cellular tissue involvement, b) with an additional nail injury, and c) with an additional open bone injury. All were covered with a semi-occlusive bandage which was replaced weekly until the wound healed, which took around four weeks. **Results:** 41 of the 47 treated fingers displayed excellent functional and aesthetic outcomes, with complete recovery of distal sensibility; nevertheless, 6 patients (14%) required additional surgery, all of whom had work conflicts. The average time for complete healing was 45.7 days, with three dressing replacements required to complete treatment. **Conclusion:** Fingertip injuries, even with the phalanx exposed, can be satisfactorily treated with semi-occlusive dressings. Reconstruction is achieved without residual pain, without additional shortening, with good strength and sensitivity, and with an excellent aesthetic appearance of the phalanx. It is also an economical and simple to replicate method.
Keywords: Fingertip injuries; distal amputation; semi-occlusive dressing.
Level of Evidence: IV

Lesiones de la punta de los dedos tratadas con apósito de sujeción intravenoso

RESUMEN

Objetivo: Demostrar que el vendaje semioclusivo logra una reconstrucción de la falange distal sin dolor residual, sin acortamiento adicional y con buen aspecto estético. **Materiales y Método:** Se evaluaron 47 dedos con lesiones distales que se dividieron en tres grupos: a) con compromiso de piel y tejido celular subcutáneo, b) con lesión adicional de la uña y c) con lesión ósea expuesta agregada. A todos se les colocó un vendaje semioclusivo con un recambio semanal hasta que la herida se curó, aproximadamente en cuatro semanas. **Resultados:** En 41 de los 47 dedos tratados, los resultados funcionales y estéticos fueron excelentes, con recuperación completa de la sensibilidad distal; 6 pacientes (14%) necesitaron una cirugía agregada, todos ellos en conflicto laboral. La media para la curación completa fue de 45.7 días y la media de recambio de apósito fue de tres en total para completar el tratamiento. **Conclusiones:** Las lesiones de la punta de los dedos, aun con la falange expuesta, pueden ser tratadas de forma satisfactoria con un vendaje semioclusivo, pues se logra una reconstrucción sin dolor residual, sin acortamiento agregado, con buena fuerza y sensibilidad, además con un excelente aspecto estético de la falange, es un método económico y fácil de reproducir.
Palabras clave: Amputación distal; dedo; vendaje semioclusivo.
Nivel de Evidencia: IV

INTRODUCTION

Fingertip injuries are those affecting the distal phalanx, distal to the terminal insertion of the flexor tendon and extensor tendon**,** with or without fracture. They account for 38% of the consultations for trauma in the upper limb.[1] There are many classifications to describe them, but none of them is widely used (Figure 1).[2] They usually leave associated sequelae, such as shortening, decreased mobility, sensation or strength. [3]

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In 1981, de Boer and Collison published a study in which they used an occlusive dressing with silver sulfadiazine on this type of wound, with which they obtained very good outcomes. These authors were interested in applying this technique to slightly more severe injuries involving loss of the pulp and terminal phalanx.[4]

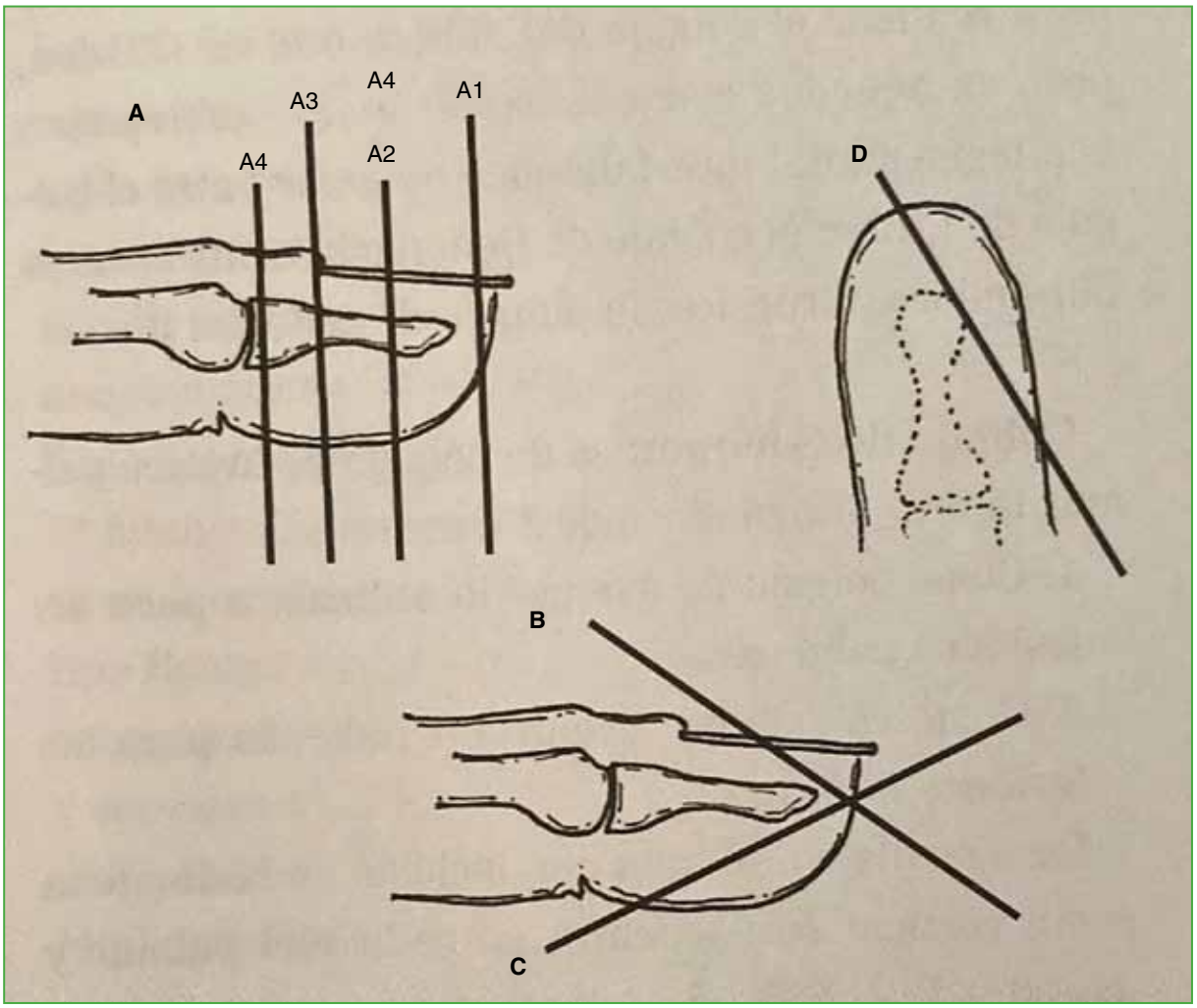

Figure 1. **A.** Right angle amputation: A1, distal without bone exposure; A2, through the nail bed; A3, proximal to the nail matrix; A4, proximal to the interphalangeal line. **B.** Dorsal angle amputation. **C.** Palmar angle amputation. **D.** Lateral angle amputation. Taken from citation 1.

Some time later, Mennen and Wiese began to use semi-occlusive dressings with a dressing whose original utility was to cover post-surgical wounds; later, other authors used 3M™ Tegaderm® for the same purpose, which was changed once a week and provided the wounds with a "temporary skin" that evolved into a painless injury, providing a medium apt to stimulate granulation and epithelization; the outcomes after 20 days of treatment were very satisfactory.[4,5]

This type of dressing generates an optimal environment in terms of pH value, temperature, and humidity, with growth factors and tissue hormones that accelerate healing and decrease scar formation in favor of local tissue regeneration.[6] The fluid that accumulates during healing resembles purulent secretion, but it is not. It may have an unpleasant odor, but this is not a reason to change the dressing, as this fluid influences the granulation that replaces the lost tissue (Figure 2).[7]

The purpose of this retrospective study was to demonstrate that semi-occlusive dressing of fingertip injuries, even with bone exposure, can result in a reconstruction with no residual pain, good sensitivity, no additional shortening, and a satisfactory aesthetic appearance.

Figure 2. Second change of the semi-occlusive dressing. The coverage of the exposed phalanx can be seen.

MATERIALS AND METHODS

We retrospectively evaluated a series of patients with fingertip injuries who were treated between 2016 and 2022 by the Upper Limb team of the Trauma Service (Table 1).

Table 1. Demographic data of the series.

Patient	Sex	Age	OAI-HI	Finger	Dominant hand		Mechanism of injury	Type of injury
1	M	30	OAI	Middle	No	Right	Blunt laceration	Nail involvement
2	M	48	OAI	Middle	No	Left	Crushing injury	Skin and SCT
				Ring	Yes	Left	Crushing injury	Skin and SCT
3	M	40	OAI	Index	No	Left	Crushing injury	Skin and SCT
				Middle	No	Left	Crushing injury	Skin and SCT
4	M	32	OAI	Middle	No	Left	Crushing injury	Bone involvement
5	M	27	OAI	Pinky	Yes	Right	Amputation	Bone involvement
6	M	30	OAI	Middle	Yes	Right	Blunt laceration	Skin and SCT
7	M	38	OAI	Middle	Yes	Right	Amputation	Bone involvement
				Ring	Yes	Right	Blunt laceration	Nail involvement
8	M	50	OAI	Index	Yes	Right	Blunt laceration	Nail involvement
9	M	39	OAI	Index	Yes	Left	Amputation	Bone involvement
				Middle	No	Left	Blunt laceration	Bone involvement
10	F	49	OAI	Index	No	Right	Blunt laceration	Bone involvement
11	M	40	OAI	Ring	Yes	Right	Sharp cut	Skin and SCT
12	M	39	OAI	Middle	No	Left	Blunt laceration	Blunt laceration
13	M	42	OAI	Index	Yes	Right	Blunt laceration	Bone involvement
14	M	50	OAI	Ring	Yes	Right	Amputation	Bone involvement
15	M	38	OAI	Index	Yes	Right	Blunt laceration	Bone involvement
16	M	17	HI	Middle	Yes	Right	Sharp cut	Skin and SCT
17	M	39	HI	Pinky	Yes	Right	Blunt laceration	Skin and SCT
18	F	32	HI	Pinky	No	Left	Amputation	Bone involvement
19	F	47	HI	Ring	Yes	Right	Sharp cut	Nail involvement
20	F	52	HI	Ring	Yes	Right	Sharp cut	Skin and SCT
21	M	47	HI	Index	No	Left	Blunt laceration	Nail involvement

M = male; F = female; OAI = occupational accident insurance; HI = health insurance; SCT = subcutaneous tissue.

All patients were treated by the same professional who used the same method and were included in the same group for the analysis of the results. All the patients gave informed consent for the proposed treatment.

Exclusion criteria were: 1) incomplete medical records or not meeting the necessary data for the study, 2) patients with injuries to the thumb, 3) patients with sprains of the distal phalanx of the finger.

The patients were divided into three groups according to Allen's classification for distal finger amputations:[8,9] a) patients with skin and subcutaneous tissue (SCT) involvement only, b) patients with additional nail involvement, c) patients with additional bone injury. A distinction was also made between those who suffered the injury as a result of an occupational accident and those who did not.

Description of the applied technique

The injured fingers were debrided and cleaned with saline and an antiseptic solution in the Emergency Department and a 3M™ Tegaderm® dressing was immediately applied (Figure 3). No antibiotics were administered. The dressing remained in place for seven days. After that time, it was changed in the outpatient clinic, cleaning the wound periphery with physiological saline, without debridement. The semi-occlusive dressing was then covered with gauze and adhesive tape. The procedure was repeated until the wound was healed. The patient was advised to make full use of the hand, including the finger under treatment.

The healing time was four weeks and required three dressing changes; the cost was USD 0.38 each (Source: MercadoLibre Argentina, box of 6 units of 3M™ Tegaderm® 6 x 7 cm).

The time necessary to achieve healing was calculated using the average and range of days passed from the beginning of treatment to medical discharge; patients discharged by physicians other than the investigator were not considered.

Regarding the presence of paresthesias and intolerance to cold after treatment, the patient's subjective expression or assessment was recorded, with two options: Yes or No.

The visual analog scale was used to document pain after treatment. In addition, the following variables were recorded and analyzed: a) sex: the absolute number and proportion of men and women are described, b) age: the age range of the sample is expressed, along with the average age plus or minus two standard errors, and the median with first and third quartiles, c) type of injury: the absolute values of injured fingers and hands are expressed; the type of injury is expressed in absolute value and proportion for each of the categories: injury only in skin and SCT equivalent to Allen's type C and D injuries; with additional nail involvement, equivalent to Allen's type B and D injury, and those with bone involvement, equivalent to Allen's type A injuries (Figure 1),[9] d) patients who suffered the injury in the work environment and patients who did not.

The mechanism of injury was expressed in absolute value and proportion for each of the categories: sharp cut, blunt laceration, amputation, and crushing injury.

To evaluate patient satisfaction with the treatment received and the outcome obtained, the patient's opinion was recorded during the satisfaction consultation, independently for each finger treated.

The proportion of patients who required surgery after dressing was calculated by dividing the number of patients who required surgery by the total number of patients included in the study.

Figure 3. Placement of the semi-occlusive dressing. Hemostasis can also be performed by manually compressing collaterals. In this case, local anesthesia was administered. Free spaces should be avoided during placement to prevent excessive fluid production.

RESULTS

Forty-one patients with 47 affected fingers were evaluated. In 15 fingers (32%), the injury involved only the skin and SCT, nine (19%) had additional nail involvement, and 23 had bone involvement.

Six of the 47 treated fingers (12.7%) required secondary surgery, all of these patients had sustained the injury in an occupational accident and all were male (Table 2).

Table 2. Levels of satisfaction

Patient	OAI-HI	Days of treatment	Additional surgery	Range of motion		Pa	VAS	Cold intolerance	Patient satisfaction
				DIP	PIP				
1	OAI	>70	Yes	Total	Total	No	2	No	Satisfied
2	OAI	51-60	No	Total	Total	No	0	No	Satisfied
		51-60	No	20°-60°	Total	No	0	No	Satisfied
3	OAI	51-60	No	Total	Total	No	0	No	Satisfied
		51-60	No	Total	Total	No	0	No	Satisfied
4	OAI	61-70	No	20°-60°	Total	No	2	No	Moderately satisfied
5	OAI	51-60	No	Blocked	>90°	No	0	No	Moderately satisfied
6	OAI	31-40	No	Total	Total	No	0	No	Satisfied
7	OAI	51-60	Yes	<20°	Total	No	0	No	Satisfied
		51-60	No	20°-60°	Total	No	0	No	Satisfied
8	OAI	>70	Yes	20°-60°	Total	No	8	No	Very satisfied
9	OAI	51-60	No	<20°	90°- 45°	No	0	No	Very satisfied
		51-60	No	20°-60°	90°- 45°	No	0	No	Satisfied
10	OAI	51-60	No	Total	Total	No	0	No	Satisfied
11	OAI	51-60	Yes	Total	Total	No	0	No	Very satisfied
12	OAI	>70	Yes	Total	Total	No	0	No	Satisfied
13	OAI	51-60	Yes	20°-60°	Total	No	0	No	Satisfied
14	OAI	51-60	No	Total	Total	No	3	No	Satisfied
15	OAI	51-60	No	20°-60°	Total	No	0	No	Satisfied
16	HI	31-40	No	Total	Total	No	0	No	Very satisfied
17	HI	41-50	No	20°-60°	Total	No	0	No	Very satisfied
18	HI	41-50	No	20°-60°	Total	No	0	No	Very satisfied
19	HI	31-40	No	Total	Total	No	0	No	Very satisfied
20	HI	31-40	No	Total	Total	No	0	No	Very satisfied
21	HI	31- 40	No	Total	Total	No	0	No	Very satisfied

OAI = occupational accident insurance; HI = health insurance; DIP = distal interphalangeal joint; PIP = proximal interphalangeal joint; Pa = paresthesia; VAS = visual analog scale for pain.

No differences in average age or mechanism of injury production were found in the study population.

Discharge was considered between day 30 and 211 (mean 45.7 days; median 35.5 days), depending on the severity of the injury; patients who had had an occupational accident required the longest time for healing.[1]

The mean number of dressings required for complete treatment was 3.42 (range 2-5).

Distal interphalangeal range of motion in the treated finger after treatment was: total in 44 (93.6%) of the treated fingers; between 90° and 45° in two (4.25%) fingers, and >90° in one finger (2.12%). No mobility blocks were observed (Table 2).

No patient had paresthesia in the treated finger after treatment.

Thirty-five (84%) did not suffer pain after treatment; six (15%) did: three had mild pain (visual analog scale between 2 and 3), and one had severe pain (visual analog scale 8).

None reported cold intolerance in the treated finger after treatment.

Twenty-nine (62%) were very satisfied with the treatment and with the aesthetic outcome; 16 (34%) were satisfied; and two (4.25%) were moderately satisfied.

When asked if they would undergo the same treatment, all said yes (Figure 4).

Figure 4. Final outcome in patients treated with semi-occlusive dressings.

DISCUSSION

The semi-occlusive bandage-directed healing method, which uses a 3M™ Tegaderm® IV securement dressing, is very simple and can be considered as a suitable treatment for fingertip injuries, even those with bone exposure.[6,7]

Although it has not been evaluated for this purpose, it has the advantage of creating a bed that stimulates healing while avoiding excessive skin maceration and facilitating painless recovery. It is transparent, so it is visible to the patient for consultation if he or she has any concerns, water resistant (though it is recommended not to get wet), and serves as an antibacterial barrier. This material additionally provides a higher rate of moisture transmission,[10] which is why it is known as a semi-occlusive bandage.

There are numerous treatments available, ranging from primary or secondary wound closure to free skin grafting, local or delayed flaps; however, none of these quickly restore sensation to the defect area.[6]

According to Mühldorfer-Fodor et al. and Ha et al., utilizing a semi-occlusive dressing for this purpose results in a higher-quality epithelial cover, even when the thumb of the finger is reconstructed using plastic surgery. Tactile discrimination in these patients after three months indicates a return to normal levels.[7]

The soft tissue cover is reinserted over the distal phalanx even if it is exposed (Figure 2); the reconstruction that takes place with this method is such that the nail matrix grows in a more natural way, reducing the appearance of deformed nails.[4,6,7,10]

Our findings are consistent with those of previous studies; it was demonstrated that this treatment achieves the expected goal of treating fingertip injuries, which is to achieve reconstruction without residual pain, with the greatest possible length and mobility, as well as a more than acceptable cosmetic outcome.

One of the described complications of this method, which discourages its use, is the odor produced during the healing process, which was not often reported by our patients.[5,11] New materials have been reported that accomplish the same purpose but increase cost.[12]

CONCLUSIONS

Our study demonstrated that patients with fingertip wounds treated with semi-occlusive, intravenous securement dressings obtain excellent aesthetic and functional outcomes, even in wounds with bone exposure. Treatment is completed with no residual pain, no additional shortening, adequate sensitivity and, in the vast majority of cases, without further interventions.

This treatment was shown to be economical, simple and a valid alternative to other more complex types of reconstruction for fingertip injuries.

We believe that its strength stems from the consistent treatment and evolution of patients provided by the same professional, as well as the sample's homogeneity and patient follow-up period based on the condition treated.

Weaknesses include the retrospective evaluation and the sample size, which could be larger, but given the population of the region, we believe it is significant.

Conflict of interest: The author declares no conflicts of interest.

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