



# Comparison Efficacy of Onion Extract plus Heparin with Flucinolone Acetonide on Midsternotomy Hypertrophic Scars Following Open Heart Surgery

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## To cite this article:

Seyed Jalil Mirhosseini, Sadeq Ali-Hassan-Sayegh, Alireza Vahidi Mehrjardi, Maryam Hadibarhaghtalab, Seyed Mohammad Yousof Mostafavi-Pour-Manshadi, Nafiseh Naderi, Mohammad Reza Lotfaliani. Comparison Efficacy of Onion Extract plus Heparin with Flucinolone Acetonide on Midsternotomy Hypertrophic Scars Following Open Heart Surgery. *International Journal of Clinical and Experimental Medical Sciences*. Vol. 1 No. 3 2015, pp. 42-45. doi: 10.11648/j.ijcems.20150103.13

**Abstract:** Background. Post-midsternotomy hypertrophic scars can lead to remarkable morbidities such as pigmentation alteration, pain, tenderness, induration, itching, and erythema so that they may be cosmetically and emotionally unacceptable to the patient undergoing midsternotomy. Initially, wound healing is induced rapidly with re-epithelialization, whereas tissue remodeling occurs several months later to create a regular scar. This study was undertaken to evaluate the efficacy of onion extract plus heparin versus Fluocinolone acetonide on scar formation after midsternotomy in patients who are candidates for coronary bypass graft (CABG) surgery. Materials and Methods. One hundred patients undergoing off- pump coronary artery bypass graft (CABG) surgery were randomly assigned into two groups, group A, onion extract plus heparin (n=50), and group B, flucinolone acetonide (n=50). After performing midsternotomy for accessing to intra-chest cavity, the target vessel was exposed and snared above the anastomosis site with zero to four sutures and a soft plastic snugger was applied to prevent coronary injury. A skilled surgeon sutured incisions of the midsternotomy. The topical treatments (gel) were started one week post operation. Subjects were then asked to return to cardiovascular center three months after the surgery for evaluation of their wounds and condition of their scars. The postoperative parameters such as indurations, erythema, pigmentation alteration, itching, cosmetic appearance, raised area of the incision, tenderness, sternal wound infection, and duration of incision improvement were evaluated by method of Vancouver scar scale. Results. The average age of all the patients was 63.8±11, 63±11.5 was related to fluocinolone acetonide group (FA) and 64±10 related to onion extract plus heparin group (OEH). Postoperative rise in scar area was observed in 63 cases, 28 cases (56%) in OEH and 35 cases (70%) in FA ( $p=0.14$ ). Postoperative erythema and itching had not significant differences in both groups, therefore, onion extract plus heparin could not diminish these complications after open heart surgery ( $p>0.05$ ). Conclusion. Onion extract plus heparin significantly decreased pigmentation alteration, duration of incision improvement, and tenderness after midsternotomy.

**Keywords:** Onion Extract, Heparin, Hypertrophic Scars, Midsternotomy, Off-Pump CABG

## 1. Introduction

Midsternotomy hypertrophic scars are characterized by abnormal, exaggerated healing response after skin injury during open heart surgery that protect the body surface

against water loss and infection. Hypertrophic scars can lead to several morbidities such as pigmentation alteration, pain, tenderness, induration, itching and erythema, therefore, they may be cosmetically and emotionally unacceptable to the patient undergoing midsternotomy.<sup>1-3</sup>

Current therapeutic methods for the prevention and management of scars are included systemic pharmaceutical treatment such as intralesional steroids and hyaluronidase, topical treatments such as silicone gel sheeting, cryotherapy, laser therapy and pressure dressings. The exact therapeutic pathway of scar formation is still unknown. Topical therapies are increasingly utilized for the patients for their ease of local consumption, non-invasiveness, comfort and relatively low costs.<sup>1-5</sup>

Onion extract (*Allium cepa*) can play the role of anti-scar on skin through up-regulation of Matrix Metallo Proteinase-1 (MMP-1) expression and can induce collagen down-regulatory properties.<sup>6</sup> Heparin possesses the ability of interacting with collagens strongly, therefore, heparin and onion extract may affect scar development through inhibition of inflammatory reaction and rate of proliferation of fibroblast.<sup>6-8</sup> Fluocinolone acetonide is utilized by the surgeons worldwide to improve post-surgical scars in patients undergoing mid sternotomy or thoracotomy. This study was undertaken to evaluate the efficacy of onion extract plus heparin versus Fluocinolone acetonide on scar formation after mid sternotomy in patients as candidates for coronary artery bypass graft (CABG) surgery.

## 2. Methods and Materials

This is a double-blind randomized clinical trial study approved by the regional committee of our university. After receiving the written consent from patients, they participated voluntarily in off-pump CABG surgery in the Afshar cardiovascular center of Yazd, Iran from February 2010 to August 2011. All the operations were performed by a skilled surgeon. The patients with a history of mid sternotomy burns and trauma in the chest area, sensitivity to corticosteroids, who were pregnant or lactating females were excluded from the study. The patients were randomly assigned into two groups, group A, onion extract plus heparin (OEH) (n=50), and group B, fluocinolone acetonide (FA) (n=50). Onions were gained from a local market in Yazd, Iran. The onions had been

cultivated and harvested in Yazd, Iran. The onions were peeled, washed three times in tap water and were dried, chopped, mixed, and then extracted. The dried onions were mechanically crushed with a food crusher (Kenwood Co, UK). The crushed onions were blended with distilled water at a concentration of 20 mg/ml, the pH was adjusted to 6.5 with phosphate buffer, and extraction was done by using the Soxhlet method. The topical gel (OEH) preparation was included 10% aqueous onion extract and 50 IU/gr heparin. The form of fluocinolone acetonide (FA) was also topical gel. After performing mid sternotomy to access to intra-chest cavity, the target vessel was exposed and snared above the anastomosis site with zero to four sutures and a soft plastic snigger was applied to prevent coronary injury. Finally, only a skilled surgeon sutured incisions of mid sternotomy. The topical treatments (gel) were started one week post operation. The cases were then asked to return to the cardiovascular center 3 months following surgery for evaluation of their wound and condition of their scars. The postoperative parameters such as indurations, erythema, pigmentation alteration, itching, cosmetic appearance, raised area of the incision, tenderness, sternal wound infection, and duration of incision improvement were collected according to the Vancouver scar scale. The groups were balanced in terms of age and sex. The individual who recorded the data was not aware of the patients' group categorization. The data collected were then analyzed by SPSS 15. We used ANOVA, Chi-Square and Fisher exact test for quantitative and qualitative variables.

## 3. Results

One hundred patients (n=100) as candidates of off-pump CABG undergoing mid sternotomy enrolled in this study. The average age of all the patients was  $63.8 \pm 11.5$ ,  $63 \pm 11.5$  was related to fluocinolone acetonide group (FA), and  $64 \pm 10$  to onion extract group (OEH). Of all the patients, induration of scars was observed in 71 cases, 35 cases in onion extract plus heparin group and 36 cases in fluocinolone acetonide group ( $p=0.82$ ).

Table 1. Demographic characteristics of both groups.

Variables	Onion extract plus heparin group (n = 50)	Fluocinolone acetonide group (n = 50)
Age (year)	64±10	63±11.5
Sex (M/F) (n)	37/13	34/16

Table 2. Postoperative outcomes in both groups.

Variables	Onion extract plus heparin group (n = 50)	Fluocinolone acetonide group (n = 50)	P-value
Induration of scars (n)	35	36	0.82
Sternal wound infection [n (%)]	8 (16%)	14 (28%)	0.14
Tenderness of scars [n(%)]	11 (22%)	31 (62%)	0.000
Raised scars [n (%)]	28 (56%)	35 (70%)	0.14
Pigmentation alteration [n (%)]	23 (46%)	35 (70%)	0.015
Cosmetic appearance [n(%)]	35 (70%)	19 (38%)	0.001
Duration of incision improvement (day)	12.38±2.8	15.08±3.16	0.000

The postoperative sternal wound infection had not significant difference between the groups, 8 cases (16%) in

OEH and 14 cases (28%) in FA ( $p=0.14$ ). Tenderness of the scar area decreased significantly in OEH, 11 cases (22%) in OEH but 31 (62%) in FA ( $p=0.000$ ). Postoperative raised scar area was observed in 63 cases, 28 cases (56%) in OEH and 35 case (70%) in FA ( $p=0.14$ ). Postoperative erythema and itching had not significant differences in both groups, therefore, onion extract plus heparin could not diminish these complications after open heart surgery ( $p>0.05$ ). Pigmentation alteration turned out to decrease significantly in OEH compared with FA, which was, 23 cases (46%) in OEH and 35 cases (70%) in FA ( $p=0.015$ ). Cosmetic appearance following midsternotomy in both groups was also compared. Out of 54 cases (54%), 35 cases (70%) were related to OEH and 19 cases (38%) to FA. Therefore, it can be concluded that the FA have more capacity in inducing cosmetic deformity compared with OEH ( $p=0.001$ ). Postoperative duration of incision improvement was  $13.7\pm3.3$  days,  $15.08\pm3.16$  days in FA but  $12.38\pm2.8$  days in OEH. It shows that onion extract can diminish the duration of incision improvement significantly ( $p=0.000$ ).

On the whole, it can be said that onion extract plus heparin possesses the capacity to significantly decrease pigmentation alternation, duration of incision improvement, and the tenderness following midsternotomy. According to our observation and patients' statements, there were not specific or non-specific complications following utilization of OEH.

## 4. Discussion

Midsternotomy hypertrophic scars are characterized by exaggerated healing response after skin injury during open heart surgery, in order to protect the body surface against water loss and infection. Various scar treatment strategies have been utilized, including systemic pharmacological treatment (intralesional steroids and hyaluronidase), and topical treatment (silicone gel sheeting, cryotherapy, laser therapy and pressure dressings). Hosnutter *et al.* reported that onion extract could improve hypertrophic scars but it did not have the capacity to lower itching following scar formation. They suggested that onion extract therapy in combination with silicon dressing could significantly ameliorate scar improvement process. According to these researchers, contractubex gel consists of onion extract (*Allium cepa* extract), allantoin and heparin sodium.<sup>8</sup> Ho *et al.* reported that contractubex gel is an effective treatment for preventing scar formation in Chinese patients with laser removal of tattoos.<sup>9</sup> Another study carried out by Beuth *et al.*, indicated that contractubex gel can significantly decrease pruritus and erythema in comparison with corticosteroid treatments. They reported that contractubex gel produces less complications such as telangiectasias and cutaneous atrophy of scars compared with administration of topical corticosteroid.<sup>10</sup> A study conducted by Chung *et al.* showed that petrolatum-based emollient (Aquaphor, Beiersdorf, Inc., Wilton, CT, USA) was a standard therapy in postoperative wound, however, the onion extract gel could not improve cosmetic scar compared with petrolatum-based emollient.<sup>11</sup> However, one of its findings was in line with that

of our study. According to our findings, cosmetic appearance alterations following midsternotomy were observed in 54 cases (54%), 35 cases (70%) in OEH and 19 cases (38%) in FA, proving that FA has more capacity in inducing cosmetic deformity compared with OEH. Jenwitheesuk *et al.* in their study reported that the combination of administration of silicone and onion extract is safe and effective in decreasing pigmentation following median sternotomy.<sup>12</sup> In addition, in a review article by Shckman *et al.* was reported that 5-fluorouracil, *Allium cepa* (onion extract), intralesional corticosteroid injection and intralesional verapamil are medical management of keloids.<sup>13</sup> Aysan *et al.* reported that single dose of contractubex (*Allium cepa* plus heparin sodium plus allantoin) could not prevent postoperative peritoneal adhesion formation.<sup>14</sup> A comparative study conducted by Perez *et al.* showed that Hydrocortisone, Silicone, vitamin E (HSE) and onion extract could significantly improve erythema and pigmentation compared with placebo, therefore, HSE and onion extract turned out to be more effective in the improvement of scars than placebo in their study.<sup>15</sup> Altogether it can be concluded that the topical treatment, which is consist of onion extract plus heparin (OEH) significantly decreases pigmentation alternation, duration of incision improvement, and tenderness after midsternotomy.

## Conflict of Interest

None Declared

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