Treatment of Hypertrophic Scars and Keloids
and the Role of the Nurse Practitioner

MASTERS OF NURSING

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Abstract

Hypertrophic scars and keloids are a common problem, particularly in people with dark skin. Nurse practitioners frequently need to know how to effectively treat this type of scarring. The objective of this literature review is to compare treatment options based on available literature to determine the best treatment. Multiple databases were used to research treatment options for hypertrophic scars and keloids. Statistics for each type of treatment were reviewed. Treatment options for hypertrophic scars and keloids included in this review are, intralesional injection, laser treatment, radiofrequency, silicone and excision in combination with intralesional steroid injection. The only treatment found to treat and prevent recurrence of keloids is excision combined with intralesional steroid injection. Other treatment options researched help to minimize symptoms, but do not entirely eliminate the scar. The best treatment option to eliminate keloids and prevent recurrence is excision and intralesional steroid injection. For reduction of pruritis (itching) and erythema (redness) alone with no chance of complete elimination the other treatment modalities researched can be recommended.

Keywords: Hypertrophic scars, keloids, intralesional injection, laser treatment, radiofrequency, silicone and excision.
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Treatment of Hypertrophic Scars and Keloids and the role of the Nurse Practitioner

Introduction

The itching, redness, restriction of movement and cosmetically displeasing appearance associated with hypertrophic scars and keloids can be very distressing for the afflicted people. “Hypertrophic scars and keloids are exuberant fibrous repair tissues that occur after a cutaneous injury” (Wolff, 2009). They are often raised, erythematous (red) and pruritic (itchy). The scars can be located on any area of the body and depending on their location may restrict the movement of extremities. Hypertrophic scars are confined to the exact location of the original injury, whereas keloids extend beyond the original injury site and often have sharp finger-like projections. These scars occur most frequently in darker skinned people, particularly people of African decent, but have been found among people of all ethnicities (Coley, 2009). Incidence of hypertrophic scarring after surgery varies from 40% to 70% and can be up to 91% following burn injury, depending on the depth of the wound (Gauglitz, 2010). Hypertrophic scars and keloids tend to appear more when wounds extend deep into the dermis or have a prolonged healing time. This type of scarring can occur at any age and occurs in both men and women. These scars can be very distressing not only for cosmetic reasons, but also because of the associated pruritus and the resultant restriction of movement.

When injury to tissue occurs there is a normal series of events occurring at the cellular level to repair cutaneous tissue. In hypertrophic scars and keloids there is a
disruption in the normal repair process. After tissue injury occurs there is platelet
degranulation and activation of the complement and clotting cascades, which then cause
hemostasis, forming a fibrin clot (Gauglitz, 2010). During platelet degranulation, there is
a release and activation of many potent cytokines including, epidermal growth factor
(EGF), insulin-like growth factor (IGF-I), platelet-derived growth factor (PDGF) and
transforming growth factor beta (TGF-beta), all of which serve as chemotactic agents
which recruit neutrophils, macrophages, epithelial cells, mast cells, and fibroblast
(Gauglitz, 2010). Extracellular matrix is a type of reparative tissue that is synthesized by
the fibroblasts. The granulation tissue made up of hyaluronic acid, procollagen, elastin
and proteoglycans, which allows for vascular growth (Gauglitz, 2010).

Wound contraction is initiated by myofibroblasts and the ECM is degraded and
immature type III collagen of the early wound is transitioned to type I collagen (Gauglitz,
2010). In normal wound healing, there is a delicate balance between ECM protein
deposition and degradation during the transformation of a wound clot into granulation
tissue and a negative feedback mechanism to signal fibroblasts when enough repair has
been done (Robles, 2007). When there is a disruption in this process, abnormalities in
scarring appear resulting in hypertrophic or keloid scar formation (Gauglitz, 2010).

**Role of the Nurse Practitioner**

Hypertrophic scars and keloids occur frequently and nurse practitioners have an
important role in education, advocacy, prevention and treatment of these scars. Education
regarding hypertrophic scars and keloids should be patient focused; including causes of
silicone was noted as a treatment type, and the search terms “silicone in treatment of hypertrophic scars” were used. Thirty-one clinical trials were found, only one was selected to be included in this analysis, because it was a clinical trial. Follow-up research used the terms, “intralesional injections in treatment of hypertrophic scars” and yielded thirteen clinical trials, some of which were already selected for review in previous searches, one new article was selected, because it was a clinical trial on treatment of hypertrophic scars and keloids. Another search; “lasers in treatment of hypertrophic scars” yielded twenty-two results, some of which were already identified for use in the literature review. One new article was selected from this search because, it was the only article found in full text that is pertinent to the research question. A final search was done using the search terms “keloid excision and steroid injection” using a cross search of multiple databases. The databases included in the cross search were, PubMed, EBSCO, Cochrane, and Web of Science with a total of fifty-five results. Of the fifty-five results only two articles were chosen for review. These articles were chosen because they were clinical trials on treatment of keloids using excision and steroid injection. The other articles were either, not clinical trials, not based on treatment options or were not available in full text. A total of eleven articles were selected for this paper. These articles were organized into one section: effectiveness of different treatment options to reduce size and symptoms of keloid and hypertrophic scars. Specific types of therapy reviewed are, intralesional injection, laser therapy, radiofrequency and treatment with silicone. The aim of this paper is to explore the effectiveness of treatment based on the identified key concepts.
Literature Review

Treatment with Intralesional Injections

Koc, Arca, Surucu and Kurumlu (2008) conducted a controlled comparative study regarding the effectiveness of intralesional Triamcinolone Acetonide (TAC) and contratubex gel (onion extract gel) and intralesional TAC alone in the treatment of hypertrophic scars and keloids. Twenty-seven patients were enrolled in the study; fourteen were treated with intralesional TAC and contratubex gel and thirteen were treated with intralesional TAC alone. Both treatment groups showed significant improvement. “TAC with contratubex gel was more effective than TAC alone in terms of pain-sensitiveness, itching, and elevation, but not in erythema and induration” (Koc et al, 2008). The decrease in size from baseline in the TAC with contratubex gel group was (p<0.05). A significant design strength is that photos were taken at each time of evaluation for comparison to last evaluation. A limitation in the design is that it is not blinded, which may skew the results.

Darougheh, Asilian, and Shariati (2007) conducted a twelve-week double blind clinical trial comparing intralesional TAC alone with intralesional triamcinolone and 5-flourouracil (5-FU) in the treatment of hypertrophic scars. Forty patients were randomly placed into two groups. Group one received treatments with intralesional TAC only. Patients in group two received treatment with both intralesional TAC and 5-FU. “The overall efficacy of TAC + 5-FU was comparable with TAC, but the TAC + 5-FU combination was more acceptable to patients and produced better results.” Fifteen
percent of patients in the TAC group and 40% in the TAC+5-FU at the last visit were rated as having a good to excellent response. This study is double blinded which increases reliability, however the four-point rating scale used by the observer is highly subjective.

Shanthi, Ernest, and Dhanraj (2008) conducted a randomized single, blind parallel group study comparing use of intralesional Triamcinolone and intralesional Verapamil in the treatment of hypertrophic scars and keloids. Fifty-four patients were randomly assigned to either receive intralesional TAC or intralesional Verapamil. Intralesional TAC and Verapamil were found to be equally effective in treatment of hypertrophic scars and keloids, though TAC produces more rapid results. Verapamil has less adverse drug reactions and yields the same results over time. Strengths of this study are the Vancouver scale and the photographs were used to assess the scars. The Vancouver scale assesses pliability, height, vascularity and pigmentation. It is a 0-4 scale, 0 being normal. A weakness of this study is that it was not double blinded and exact statistics are not reported in the results.

Zhibo, Xiao, Miaobo, Zhang (2009) conducted a study to test the effectiveness of intralesional botulinum toxin type A in the treatment of keloids. Twelve patients were selected for this study, the number of keloids per patient varied from one to three. Intralesional botulinum toxin type A is effective in the treatment of hypertrophic scars and keloids. “The therapeutic outcome in these twelve patients was excellent in three patients, good in five patients, and fair in four patients” (Zhibo, 2009). Therapeutic
response was based on observations from an independent observer, patient satisfaction and photographic records. The strengths of the study design are the photographs were taken of hypertrophic scars and keloids both prior to treatment and at each treatment to document changes, and an independent observer graded the scars on a five-point scale based on size, height and induration. A limitation of the study is the small (n=12) number of participants in the study.

**Treatment with Intrallesional Injection and Laser Treatment**

Alster (2003) conducted a randomized qualitative comparison study evaluating the effectiveness of 585-nm pulsed dye laser (PDL) alone and in combination with intrallesional corticosteroid in the treatment of hypertrophic scars and keloids. Twenty-two females with hypertrophic scars following breast reduction surgery were included in this study. For each patient, the hypertrophic scar on one breast was treated with PDL alone and the hypertrophic scar on the other breast was treated with PDL and intrallesional corticosteroid. The scars were graded on pliability and itch/burn using a 0-4 scale, zero being asymptomatic and four being the greatest level of symptoms. At six weeks the scars were evaluated. The average rating for PDL alone was 2.42 and the average rating for PDL with intrallesional steroid was 2.5. Symptom scores were reduced by 50% after PDL treatment and 70% with the addition of intrallesional corticosteroid. Treatment with PDL yielded significant clinical improvement; the addition of intrallesional corticosteroid did not significantly improve histological appearance, but did improve symptoms associated with hypertrophic scars and keloids, such as pruritus and
Pliability. The strengths of this study are the photographic documentation was used to compare scars from previous visits, and that the participants are all of the same gender and all acquired their scars as a result of the same surgical procedure and within the last 72 months. A design limitation is the study was not blinded.

Kawecki, Bernard-Wisniewska, Sakiel, Nowak, Andriessen (2008) conducted a quantitative analysis to determine efficacy of lasers in the treatment of hypertrophic scars and keloids. Three hundred twenty-seven patients were selected and treated with a Derma K laser. Laser treatment was found to be effective in reducing erythema, height, and stiffness. After treatment 192 out of 327 had normal skin tone compared to 92 out of 372 before treatment. Softness of skin was analyzed after treatment, 192 out of 327 had soft skin and 62 out of 327 had soft skin before treatment. On initial assessment 72 out of 327 had a flat scar, and after treatment 272 out of 327 had a flat scar. A major study design strength is there was a very large sample size. The study limitations are; the study was not blinded and results are not objective.

**Treatment with Radiofrequency**

Meshkinpour et al. (2005) conducted a qualitative study comparing the treatment of hypertrophic scars and keloids with a radiofrequency device. Ten subjects were chosen to participate in this study. Each scar was divided into thirds, one third receiving one treatment, one third receiving two treatments and one third receiving no treatment. At 12 weeks, the control sites were rated at 5.5 out of 6.7, the areas treated once were rated at 5.5 out of 7 and the areas treated with two treatments were rated at 5.7 out of 7. At the 24 week evaluation the control sites were rated at an average of 5.5 out of 8.5, the
areas with one treatment 5.5 out of 8.5 and areas with two treatments 5.7 out of 8.5.
Punch biopsies were also done for histological evaluation. Histological findings
demonstrated no significant change between the treated areas and non-treated areas.
Radiofrequency does not cause any adverse reactions, though it also does not clinically
improve hypertrophic scars and keloids. A strength of this study is, the same rating scale
was used for each patient with five different characteristics rated. The five characteristics
rated were symptoms (itch/burn), pigmentation, vascularity, pliability and height. The
major limitations of this study are that it was not blinded, each scar is divided into thirds
making it hard to ensure only those sections receive treatment and treatment statistics are
not given making it more difficult to evaluate effectiveness.

**Treatment with Silicone**

Van den Kerckhove et al. (2000) conducted a randomized quantitative study
comparing the treatment of hypertrophic scars with occlusive plates made of: either
silicone gel, silicone elastomer or plastic to improve erythema. Sixteen scars were
divided into four areas, each area was randomly assigned to treatment test plates. The
test plates were either silicone gel, silicone elastomer or plastic. Silicone, both elastomer
and gel, are equally effective in reducing erythema and are more effective than plastic.
“Silicone as a pressure medium resulted in a significant reduction in erythema” (Van den
Kerckhove, 2000). When comparing the three treatments there was no significant
evolution over time between the treatments (P=0.13). A major study design strength is,
redness is evaluated using Minolta chromometer, making the change in redness objective.
A weakness in the study is it is only measuring improvement in erythema, not any of the
other characteristics of hypertrophic scars and keloids and statistics of the study are not well outlined.

Puri and Talwar (2009) conducted a quantitative study testing the efficacy of self-drying silicone gel in the treatment of hypertrophic scars and keloids. Thirty patients were selected for this study. Silicone gel was applied twice daily and was rubbed in for 2-3 minutes. Self-drying silicone gel is effective in the treatment of hypertrophic scars and keloids. After treatment, sixty percent of scars were graded as normal (flat, soft and normal in color), twenty percent were mildly hypertrophic and twenty percent were graded as hypertrophic or keloid in nature. A strength of this study is that photographs were taken at the first visit and at the last visit for comparison. Major limitations of this study were scars are graded on a single four point scale, there is no control group and it is not blinded.

**Treatment with Excision and Intralesional Injection**

Hamrick, Boswell and Carney (2008) conducted a clinical trial evaluating the effectiveness of keloid excision with injection of kenalog pre-operatively, intra-operatively and post-operatively in the treatment of keloids. Fifteen patients with keloids due to ear piecing and one due to trauma were included in this study. The results at the six month evaluation show that 94% were successfully treated with no signs of recurrence. The one patient that failed with treatment did so due to lack of follow up. She did return eighteen months later for evaluation and re-treatment was necessary. The keloid was injected again preoperatively with Kenalog and re-excised. She continued to
follow up and have steroid injections at six-week intervals, and at twelve months she had no signs of recurrence. A strength of this study is the treatment regimen was found to be successful. A limitation in the study design is the sample size is small and the method of evaluation is not well defined.

Rosen, Patel, Freeman and Weiss (2006) conducted a retrospective analysis of patients treated for keloids with excision and one intra-operative and two post-operative injections of steroids over a five year period. This analysis was done using patient charts and by interview. Sixty-four patients were included in the analysis, with ninety-two keloids being treated. Results of the study per patient charts were, seventy-four out of ninety-two keloids did not recur. Twenty-six patients were contacted for interviews, the remaining patients did not have updated contact information. Of the twenty-six contacted for interviews, all twenty-six had no recurrence of the treated keloid. The strengths of this analysis are that it is a large sample size and long-term follow up was a minimum of five years. Limitations of the analysis is that there is no objective measure for the recurrence rate and researchers rely on subjective analysis in charts and patient subjective analysis.

Significance and the Role of Nurse Practitioners

Hypertrophic scars and keloids are a problem for persons afflicted with them due to their appearance, associated itching, irritation and restriction of movement. Nurse practitioners need to be vigilant in educating high-risk individuals during well-visits about the importance of reducing cutaneous injury whenever possible to reduce risk of
developing unsightly, restrictive and pruritic hypertrophic scars or keloids. Risk reduction includes avoidance of elective surgery, body piercing or any other unnecessary tissue injury. Prevention of keloids and hypertrophic scars in high-risk individuals needing to undergo surgery is important as well. The clinical trials by Rosen et al. (2006) and Hamrick (2008), intralesional injection of steroid intra-operatively during excision of keloid assists in erasing and preventing the return of that keloid. It could be proposed that intra-operative injection of steroid into the wound may prevent keloid from occurring, though this theory was not researched during this literature review. Nurse practitioners also need to educate patients about the treatment options once they have hypertrophic scars and keloids. As patient advocates nurse practitioners need to ensure the chosen treatment is available to the patient; either through administration by the nurse practitioner or through referral to a provider specializing in the specific type of treatment. There are a variety of treatment options available to reduce size and symptoms including, the use of intralesional injection, laser treatment, radiofrequency and silicone. Based on research evidence, the best treatment option to eliminate keloids and prevent recurrence based on this research is excision with intralesional steroid injection. Insurance coverage for various procedures may vary; as an advocate for patients it is important that nurse practitioners determine on a case by case basis which treatments are covered and/or assist patients in getting coverage for treatment.

Knowledge of proper treatment for hypertrophic scars and keloids is essential to nurse practitioner practice. Hypertrophic scars and keloids occur frequently in high-risk groups and it is important that the best treatment be offered to patients. Evidence
suggests that nurse practitioner should suggest excision and injection with intralesional steroid to have the least probability of recurrence.
References


