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TREATMENT OUTCOMES OF EXTRALESIONAL AND INTRALESIONAL OF KELOID EXCISION FOLLOWED BY POSTEXCISION SUPERFICIAL RADIOTHERAPY: A COMPARATIVE STUDY
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TREATMENT OUTCOMES OF EXTRALESIONAL AND INTRALESIONAL OF KELOID EXCISION FOLLOWED BY POSTEXCISION SUPERFICIAL RADIOTHERAPY: A COMPARATIVE STUDY

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ABSTRACT

***Background*: Keloids are dermato-fibroproliferative skin disorders that extend beyond the original wound and are often characterized by benign overgrowth in response to skin injury. Surgical management of keloids has been performed by either intralesional or extralesional excision. There has been no consensus regarding the optimal treatment for reducing recurrence and complications.**

***Objective*: To determine the outcome of keloids managed with intralesional or extralesional excision followed by post-excision superficial radiotherapy.**

Design: This was a comparative study

Setting: Department of Surgery, Kenyatta National Hospital, University of Nairobi, Kenya.

Subjects/Participants: Patients with keloids managed in the Department of Surgery, Kenyatta National Hospital, from April 2018 to April 2020.

***Results:* A total of 90 patients with 104 keloids were managed during a two-year prospective study, with 56 keloids operated on in the intralesional group (IL) and 58 keloids operated on in the extra-lesional (EL) group. The post-surgery pruritus score after one year of follow-up was 1.98 in the IL group and 1.86 in the EL group. The recurrence rate was 21% in the IL group and 18.9% in the EL group. Overall, patient satisfaction was high.**

Conclusion: There was no difference in the outcome of keloid excision between the two treatment modalities. We concluded that both modalities can be utilized in managing keloids. Further research should be done to compare both treatment methods with other adjunct therapies, such as steroids and cytotoxic agents.

Key words: Keloids excision intralesional extralesional recurrence

INTRODUCTION

Keloids are dermato-fibroproliferative skin disorders characterized by excessive deposition of collagen in the dermal layer of the skin, most commonly found on the head, neck, upper back and chest areas of the body (1-4). They are more common in dark skinned individuals although recent studies have also shown them to occur in albinos with the same prevalence as non-albino populations (2, 5-7).

Keloid management has been performed by a multimodal approach with both surgical and nonsurgical treatment options. All options have, however, been associated with high recurrence rates often reaching 50 percent (1-5). Most studies performed on the surgical approaches to keloid management as a determinant of recurrence have either been retrospective or laboratory-based with few prospective studies (9-11). Despite the fact that the main symptoms for keloid presentation are pain,

pruritus and disfigurement, most of these studies have only focused on recurrence in terms of keloid regrowth with no emphasis on pain and pruritus, which are also of concern to patients.

Keloids can be surgically excised in an extralesional (EL) or intralesional (IL) manner (Figure 1, 2). However, EL excisions can cause trauma to the normal skin and may lead to an increased likelihood of recurrence and stimulation of new keloid formation (12). In practice, however, situations may be encountered where either surgical option may be required, such as treating keloids in an esthetically demanding location of the face, which may require extralesional excision for better cosmetic outcome. On the other hand, treating extensive keloids may be impractical for closing the wound primarily if extralesional excision is performed; thus, intralesional excision may enable one to use part of the remaining keloidal skin to close the defect. Whether either of these factors could influence recurrence is not known.

We undertook this study to determine the treatment outcomes of patients managed with both IL and EL modalities in our unit at Kenyatta National Hospital, a tertiary teaching and referral facility in Kenya.

MATERIALS AND METHODS

Study design: This study was a prospective longitudinal comparative study

Study Setting: Department of Surgery, Kenyatta National Hospital, from April 2018 to April 2020.

Study Subjects/Participants: Patients with keloids amenable to surgery who met the inclusion criteria.

Sampling Procedure: Patients were systematically randomly sampled into two groups: group 1 patients were managed by intralesional surgical excision (IL group) with excision margins of at least three millimeters (mm) from the edges of the keloid, and group 2 were managed by extralesional excision with an excision margin of at least 3 mm in the surrounding normal tissue (EL group) (figures 1-5).

SELECTION CRITERIA

Inclusion criteria: Patients of more than 18 years of age with keloids amenable to surgical excision and primary closure of the wounds.

Exclusion Criteria: Patients less than 18 years of age, those who had infected keloids or those who had undergone a prior surgery with recurrence.

Surgery was performed by the same surgical team for all patients. The local anesthetic used was 2% lidocaine with a 1:1000 adrenaline solution. Electrical cautery was utilized to control bleeding, and wounds were closed in two layers with 3/0 polyglycolic sutures for dermal closing and 3/0 nylon sutures for transcutaneous stitching for all patients. The prophylactic antibiotic given was cefuroxime at the start of the surgery. Postoperative pain management for all patients involved a combination of acetaminophen and diclofenac for one week. Prior to surgical excision, pain and pruritus scores were determined using a visual analog scoring system. This was repeated during periodical follow-up, assessed at each appointment held three, six and twelve months postsurgery. After surgical excision, all patients had one session of 15 gray (Gy) superficial radiotherapy within 24 hours of surgery, and the excised keloid tissue was retrieved for histology to confirm whether the margins were involved. Independent variables in the study were patient age, anatomical location of the keloids, and surface area of the keloids. Dependent variables were postoperative complications, postsurgical pain, pruritus and keloid recurrence after one year of surgery. Recurrence was defined as keloid regrowth beyond the margins of the scar or pain and/or pruritus that exceeded the pre-surgical status that required further medical intervention in the course of follow-up. Postoperative follow-up occurred one week, one month, three months, six months and one year postsurgery. All data captured were analyzed using SPSS computer software version 2010 and compared using Student's t-test and the Chi-square test for variations.

RESULTS

A total of 96 patients with 112 keloids were enrolled in the study. Six patients with eight keloids did not complete their participation in the study, leaving a total of 90 patients with 104 keloids giving an average of 1.16 keloids per patient Of the 90 patients, 45 with 56 keloids were in the IL group, and the remaining 45 had 58 keloids and were designated to the EL group. The mean age for the IL and EL groups was 28.6 and 27.5 years, respectively (p-value 0.853). The male: female ratios were 1:2 for the IL group and 1:2.5 for the EL group. (The difference was not statistically significant; p-value 0.723). The anatomical locations of the keloids were the ears (42.8% IL, 39.6% EL), cheek (16% IL, 15.5% EL), abdomen (10.7% IL, 13.7% EL) and chest (12.5% IL 13.7% EL) Pearson correlation to determine the relationship between anatomic location and Intralesional Vs Extralesional showed a strong positive relation of, r = 0.9793.

The differences in the proportions of keloid locations between groups were not statistically significant. The surface areas of the keloids excised in the two groups were 8.95 cm^2 (IL) and 9.35 cm^2 (EL), and the

difference was not statistically significant (*p*-value 0.909). The preoperative pain score for the IL group was 2.47 compared to 2.14 for the EL group (*p*-value 0.925), while the preoperative pruritus score for the IL group was 4.25 compared to 4.75 for the EL group (*p*-value 0.887). Pearson correlation to determine the relationship between the above parameters in both groups showed a strong positive relations of r = 0.9998 Complications encountered in the IL group were wound dehiscence for 2 keloids.

Figure 1: Extra-lesional keloid excision, with incision line marking in approximately 3 mm of normal, non-keloid-tissue.

Figure 2: Intra-lesional keloid excision, with an incision line marking in at least 3mm of keloid-tissue.

While IL excisions of the keloid leaves a rim of keloid tissue behind that may sacrifice esthetic quality, EL excisions results in complete excision of the keloid tissues, leaving a wound that is fully devoid of keloid and thereby produces better esthetic results. (Figure 3, 4).

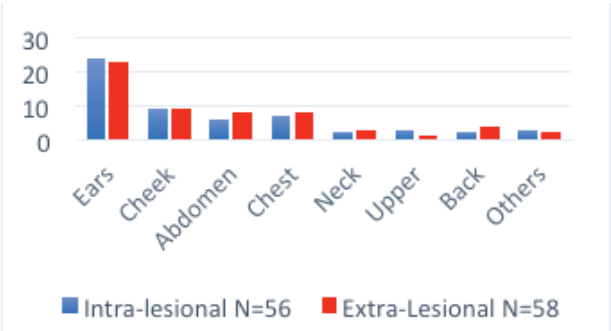

Figure 3: Anatomical locations of the keloids. There was no significant difference between the two groups for any anatomical site.

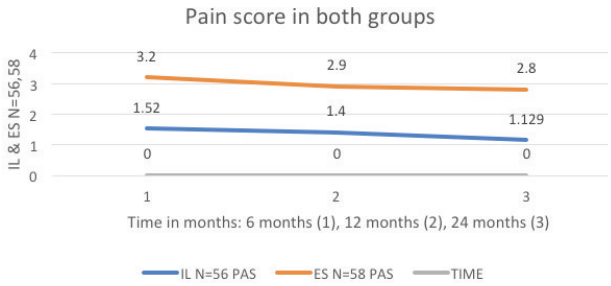

Figure 4: Summary of the pain score. The extra-lesional group had a higher pain score 3, 6 and 12 months post-surgery than the intra-lesional group, but the difference in the mean pain score was not statistically significant (P > 0.05).

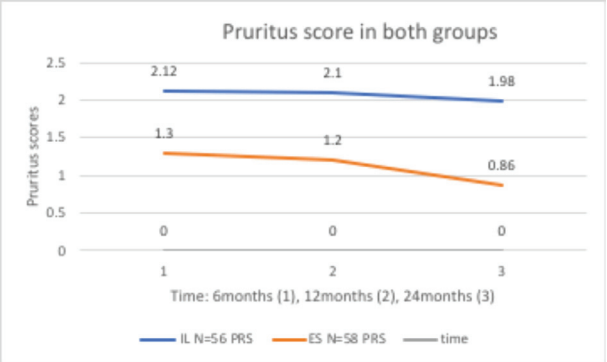

Figure 5: Pruritus score in both groups

These keloids were managed conservatively and had healed by the one-month follow-up. In the EL group, one keloid had wound dehiscence, and two had postsurgical wound sepsis. All healed fully by the second month of follow-up. There were no statistically significant differences in the complication rates of the two groups. Postoperative pain scores after 3, 6 and 12 months of follow-up were 1.52, 1.40 and 1.129 for the IL-group and 3.20, 2.9 and 2.8 for the EL-group, respectively. The postoperative pruritus scores after 3, 6 and 12 months of follow-up were 2.12, 2.10 and 1.98 for the IL-group and 1.30, 1, 20 and 0.86 for the EL-group, respectively. There was no significant difference between the IL and EL groups in terms of the pain and pruritus scores during the postoperative follow-up. Keloid recurrence after 12 months of follow-up was 12 keloids IL and 11 keloids EL group respectively. There was no statistically significant difference in the recurrence rate between the two groups.

DISCUSSION

Surgical management is one of the mainstays in the treatment of keloids. This modality of treatment has been associated with high recurrence rates,

especially when carried out as a monotherapy (1). It is recommended that surgery should be performed in combination with other modalities to reduce the recurrence rate (1, 4, 5). The excision can either be intralesional or extralesional. Although both modalities have been in practice for many years, controversy remains regarding whether they influence keloid recurrence and complications. The reasons why this has not been resolved could include the fact that keloid pathophysiology is still poorly understood; for example, it is not clear whether keloids are inflammatory or proliferative disorders (6). Another reason is the lack of well-executed level 1 or 2 studies comparing the two modalities of treatment. The majority of studies cited have either been case series or retrospective studies that have inherent weaknesses in addressing the merits and demerits of the various surgical options (9-11). Our study provides level 2 evidence in the management of keloids with either modality of treatment.

Proponents of intralesional excisions argue that keloid disease is stimulated by trauma to normal skin. Therefore, excising keloids out of their margins may stimulate normal skin into keloid formation, resulting in higher recurrence rates (12). The argument is supported by the fact that patients with keloids tend to form them anywhere on the body once stimulated by any form of trauma. They further argue that the histologically active part of the keloid is the central core, and removing it leaves a relatively inactive peripheral zone, reducing the chances of further keloid overgrowth (12). However, available evidence suggests otherwise. Syed F *et al* demonstrated that fibroblasts from the growing margins of keloids produced more collagen than fibroblasts from intralesional or extralesional sites (13). Luo *et al* in an *in vitro* study found that fibroblasts from different parts of keloids demonstrated similar doubling times and did not show central fibroblasts to be more active than those from other sites (14).

Extralesional excision of keloids is based on the assumption that keloids should be treated as a form of 'neoplasm' and should thus be managed with wide local excision based on the oncological principles of neoplasm management. The assumption in this school of thought is that keloid-forming tissue have a proliferating disease core, as suggested by Chong y *et al. that* transforms into the keloid and must thus be fully removed (15). This raises the fundamental question of whether keloid formation is an excessive reaction to body injury or a case of abnormal fibroblast proliferation. *In vitro* studies have demonstrated that normal fibroblasts may be stimulated into keloid formation by cytokines from keloid fibroblasts, putting doubt to the proliferating disease core concept (16). Clinical experience has also shown that keloid-forming patients have a tendency to form keloids virtually anywhere on the body after any form of trauma, suggesting that keloid disease is not a local but a regional or `systemic disease'.

Our study compared two subset populations with keloids with the same patient characteristics. The mean age, anatomical location, keloid surface area and clinical factors, such as pruritus and pain, were virtually similar in the two groups. All patients were operated on with the same surgical team using similar sutures. The wounds were all dressed with the same dressing materials, and postoperative pain management was similar in both groups. Postsurgery, all patients were subjected to the same dose of radiotherapy within 24 hours of surgery. Postoperative follow-up for the patients was also similar. The complication rates in the two groups were virtually the same. Although the pruritus score was higher in the IL group than in the EL group, the difference was not statistically significant. The pain score, though higher in the EL group, was also not significantly different from that of the IL group. The recurrence rate was slightly higher in the IL group than in the EL group. The recurrence in the IL group at 3, 6 and 12 months was 9, 11 and 12 respectively. For the EL group was 8, 10 and 11 at 3, 6 and 12 months respectively. However, the difference was not statistically significant.

The above findings suggest that the outcome of keloid management between the two modalities of management after one year of follow-up with postexcision superficial radiotherapy was virtually the same. Our finding differs from some previous studies that concluded that incomplete excision of keloid lesions is associated with higher recurrence rates than complete keloid excisions (15,17). Tan *et al*. found that keloids in patients who underwent incomplete excision had higher recurrence rates than those with completely excised margins (17). Their study was based on archived keloid specimens with clinical data captured retrospectively from records. The role of postsurgical adjuvant therapies and whether they could have influenced the outcomes were not well described. Further differences from our study are the fact that data on other symptoms, such as pain and pruritus, were not captured, making it difficult for one to decide whether these could have been affected by the type of excision. Another study by Chong Y *et al*. on auricular keloids demonstrated that patients with clear keloid margins had lower recurrence rates than those whose keloid specimens had involved margins (16). Their study was based on histological examinations of keloid specimens to determine whether margins were involved and correlated with keloid recurrence. The postexcision adjunct management of the patients was not disclosed in this study either. As in the Tan *et al* study, little was mentioned about other symptoms, such as pain and

pruritus, which are key complaints by the majority of patients in our population and should be considered part of the recurrence spectrum.

However, some studies have demonstrated good outcomes with intralesional excision of keloids. Donkor P, in a series of patients who had been operated on with intralesional excision followed by postexcision steroid injection, reported no keloid recurrence after two years of follow-up (18). Another study by Engrav LH *et al.* on the management of hypertrophic scars/keloids demonstrated better outcomes with intralesional excisions than with extralesional excision (19).

CONCLUSION

The outcomes of extralesional and intralesional keloid excision with postexcision superficial radiotherapy are similar. Both modalities of treatment have comparable complications and recurrence rates. Each modality of treatment has a role in the management of patients with keloids. Intralesional excision may be indicated for patients with extensive keloids for whom primary closure may be a problem if the whole keloid is excised. Extralesional excision, on the other hand, may be indicated in cases where complete excision of the keloid is possible with primary wound closure. It should further be considered in esthetically sensitive areas of the body such as the head and neck. We therefore advocate for both management strategies based on the extent and location of the keloid and the surgeon's preference.

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