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Outcomes of Skin Punch Biopsy Wounds Assessed Using the Southampton Wound Grading System

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Abstract

Introduction: Skin biopsy punch is a common instrument used by dermatologists in day-to-day practice. The use of this device is associated with minimal complications. However, we cannot deny the possibility of adverse effects. We aimed to grade and track therapeutic skin punch biopsy wounds over 3 months using Southampton Wound Grading System (SWGS).

Materials and Methods: Selected patients in whom skin punch biopsy could be used therapeutically were enrolled. The procedures were performed under local anesthesia with suturing whenever needed. Immediate complications were noted, with follow-ups after 1 week, 1 month and 3 months. The complications were noted, and the wounds were graded.

Results: **A** total of 56 lesions from 45 patients underwent five procedures (punch excision, narrow hole extrusion technique, pinch-punch excision, enucleation of corn, and punch grafting). The most common immediate complication was dog-ear defect; surgical wound dehiscence predominated at one week and one month, while post-inflammatory hyperpigmentation and hypertrophic scars were most common at three months. SWGS grades after one week were IC (67.86%), 0 (17.86%), IA (12.50%), and IIC (1.78%); after one month, 0 (64.29%) and IC (35.71%); after three months, 0 (76.79%) and IC (23.21%). Inferential analysis showed that larger punch sizes were associated with higher complication rates (p=0.049), and sutured wounds had more complications than non-sutured wounds (p=0.0028).

Conclusion: There were predominantly minor complications like dog-ear defect and mild erythema, with no postoperative infections. Larger punch sizes and suturing were associated with more complications, underscoring careful punch selection and closure technique.

Keywords: Dermatosurgery; Dog-ear defect; Skin biopsy punch; Southampton Wound Grading System; Surgical Wound Dehiscence.

Introduction

A skin biopsy punch is a versatile instrument used for diagnostic, therapeutic, and cosmetic purposes in dermatology.[1] It is used to obtain skin biopsies and excise various lesions.[2] Most procedures involving skin biopsy punches are easy to perform, with minimal complications. However, there are chances of complications. The Southampton Wound Grading System (SWGS) is a scoring system to assess the severity of wound infection.[3]

There are only a few studies that have assessed the outcomes of skin punch biopsies quantitatively. A common misconception is that the device serves solely as a diagnostic tool. So, many clinicians pay less attention to potential complications, focusing mainly on reaching a pathological diagnosis.

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The primary objective of this study is to grade and track complications of therapeutic skin punch biopsy wounds over 3 months using SWGS. The secondary objective is to explore associations between the complications and factors like punch size, suturing, and procedure type.

METHODS

This was a prospective, observational, longitudinal, hospital-based study conducted at Nepal Medical College Teaching Hospital (NMCTH) from January 2020 to December 2020. Ethical approval was obtained from the Institutional Review Committee of NMCTH (Ref: ThesisProp 03-076/077). Informed written consent was obtained from all study participants prior to enrollment. The primary aim was to evaluate the therapeutic outcomes of various skin punch biopsy procedures performed for selected dermatologic conditions. Throughout this manuscript, 'skin punch biopsy' denotes the procedure, and 'skin biopsy punch' denotes the instrument.

We used consecutive non-probability sampling of all eligible therapeutic lesions presenting during the study period. The sample size was calculated using the single-proportion method with finite population correction at a 95% confidence interval (CI). The expected proportion of therapeutic use was 19.67%, based on 122 procedures (N) from the dermatology Outpatient Department (OPD) records from August 2018 to July 2019. The absolute precision (d) was 0.085, which gave $n_0 \approx 84$ and corrected sample size (n) ≈ 50 lesions.

Diagnostic procedures were excluded, as were patients with active infections, bleeding disorders, or keloidal tendencies. The sample was drawn from patients attending dermatology OPD and thus represents an urban hospital-attending population. The target population for generalization includes patients with similar skin conditions in resource-limited areas. The unit of analysis was the lesion/procedure.

Preoperatively, relevant medical history was recorded, and a focused physical examination, particularly of the skin lesions, was performed in all patients. Complete blood count (CBC), bleeding profile and Human Immunodeficiency Virus (HIV), hepatitis and syphilis screening were performed. The intervention involved performing minor surgical procedures using disposable skin biopsy punches (2 mm to 5 mm in diameter), according to the nature and size of the lesion. Five procedures were performed: - punch excision,[1] Narrow Hole Extrusion Technique (NHET),[1] pinch-punch excision (PPE),[4] enucleation of corn,[1,5] and punch grafting[6]. All procedures were performed under local anesthesia in aseptic conditions. Suturing was done whenever necessary using Prolene (3-0 to 6-0) and chromic catgut (5-0 for genital lesions). One to three sutures were applied, using either simple interrupted or vertical mattress techniques.

Postoperatively, prophylactic antibiotics were prescribed to all patients. The sutures were removed after 5-7 days over the face and after 10 days elsewhere. The patients were evaluated for immediate complications. They were advised follow-up at 1 week, 1 month and 3 months, at which any complication was noted. The SWGS used for follow-up grading is summarized in Table 1. When it was not feasible for the patients to come to the OPD, they submitted photographs of the operated sites via secure messaging applications. The patients were also asked about any symptoms, if present. Images were independently reviewed by two dermatologists to ensure SWGS grading accuracy.

Descriptive statistics were used to summarize baseline data, types of procedures, and wound healing outcomes. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Associations between complications and age, sex, lesion site, punch size, suturing status, procedure type, and lesion type were evaluated using the Chi-square test of independence; Fisher's exact test was applied for 2×2 tables or when expected counts were <5. Statistical significance was set at $p < 0.05$. All analyses were performed using SPSS version 21.

RESULTS

A total of 56 lesions were taken from 45 patients, among whom 25 were men and 20 women, with the male-to-female ratio of 1.25. The mean age of the patients was 31.24 (± 11.64) years. A total of 19 conditions were treated, among which compound nevus was the most common. Other conditions treated were sebaceous cysts, lipoma, scrotal calcinosis, dermatofibroma, corn, glomangioma, lentigines, molluscum contagiosum, trichilemmal cysts, vitiligo, acrochordon, acquired digital fibrokeratoma, anetoderma, prurigo nodularis, pyogenic granuloma, palmar wart, schwannoma, and trichofolliculoma.

Punch excision,[1] NHET,[1] PPE,[4] enucleation of corn,[1,5] and punch grafting,[6] were performed in 31 (55.36%), 14 (25.00%), 7 (12.50%), 2 (3.57%) and 2 (3.57%) cases respectively. NHET was used for lipoma, sebaceous cysts, and trichilemmal cysts. PPE was used for scrotal calcinosis, and molluscum contagiosum. The most common site operated was the face (41.07%) followed by trunk (17.86%), upper limbs (16.07%), genitalia (10.71%), lower limbs (7.14%), scalp (3.57%), and neck (3.57%). Suturing was done in 45 (80.36%) cases.

Immediate complications occurred in 10 (17.86%) cases, all of which were dog-ear defects.[7] One-week post-procedure, the most common complication was surgical wound dehiscence (SWD),[8] which occurred in 13 (23.21%) cases followed by pain in 2 (3.57%) cases. SWGS grades after one week were IC (67.86%), 0 (17.86%), IA (12.50%) and IIC (1.78%) (Figure 1).

After one month, the most common complication was again SWD (28.57%), followed by post-inflammatory hyperpigmentation (19.64%), atrophic scars (5.36%),

Table 1:- Southampton wound grading system (SWGS).[3]

Grade	Appearance	
0	Normal healing	
I	Normal healing with mild bruising or erythema	A- Some bruising B- Considerable bruising C- Mild erythema
II	Erythema plus other signs of inflammation	A- At one point B- Around sutures C- Along wound D- Around wound
III	Clear or hemoserous discharge	A- At one point only B- Along wound C- Large volume D- Prolonged (>3 days)
IV	Pus/purulent discharge	A- At one point only B- Along wound
V	Deep or serious wound infection with or without tissue breakdown; hematoma requiring aspiration	

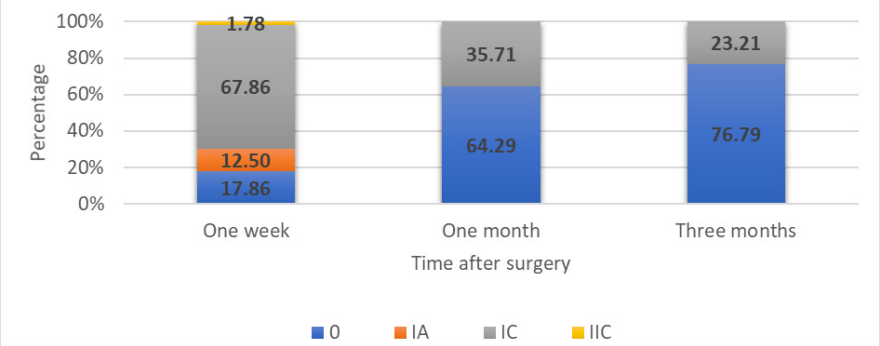

Figure 1: Distribution of SWGS grades over time after therapeutic skin punch biopsy. Stacked bars show SWGS grades at 1 week, 1 month, and 3 months across all lesions (n=56). No grade III–V (discharge/pus/deep infection) occurred. Values are percentages; totals within each time point sum to 100%.

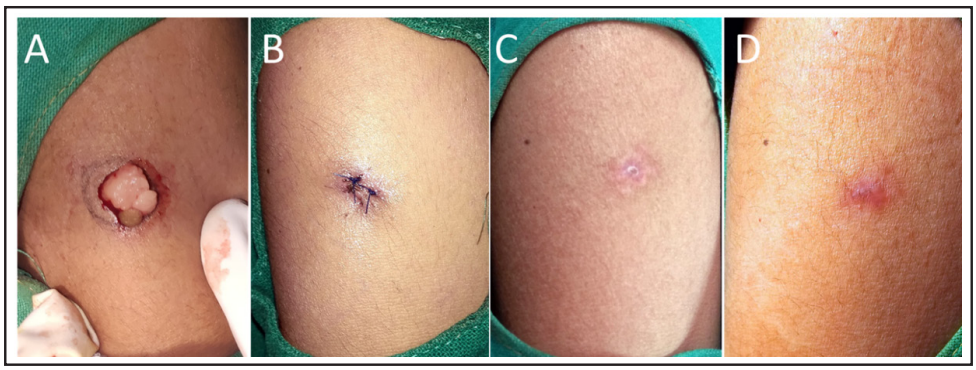

Figure 2: Narrow Hole Extrusion Technique (NHET) for lipoma using a 5-mm skin biopsy punch (A). The SWGS was classified as grade IC at intervals of one week (B), one month (C), and three months (D).

hypertrophic scars (3.57%) and recurrence (1.78%). SWGS grades after one month were 0 (64.29%) and IC (35.71%) (Figure 1).

After three months, the most common complications were post-inflammatory hyperpigmentation (PIH) and hypertrophic scars which occurred in 8.93% of cases, followed by atrophic scars (5.36%) and hyperkeratosis (3.57%). SWGS grades after three months were 0 and IC, which occurred in 43 (76.79%) and 13 (23.21%) cases respectively (Figure 1). No postoperative infections were reported in any of the follow-ups (SWGS grades IV–V: 0%).

All cases treated with enucleation of corn achieved grade 0 after one week. Similarly, all punch grafting and PPE cases reached grade 0 within one month. Among those treated with punch excision, 80.65% achieved

Table 2:- Association between characteristics and overall complications. (Significance: p < 0.05. Fisher's exact reported for 2×2 tables; Chi-square for tables with >2 categories.)

Variables	Test	p-value	Significant
Punch size (2-5 mm)	Chi-square	0.049	Yes
Suturing (sutured vs not)	Fisher's exact	0.0028	Yes
Procedure type	Chi-square	0.109	No
Sex	Fisher's exact	0.344	No
Age group	Chi-square	0.309	No
Site of lesion	Chi-square	0.871	No
Diagnosis	Chi-square	0.057	No

Note: For suturing, Chi-square also showed significance ($p \approx 0.004$).

grade 0 by three months, while only half of NHET cases achieved grade 0 after three months (Figure 2).

Skin biopsy punch size also influenced healing outcomes. All 2.5 mm skin biopsy punches achieved grade 0 by one month, while all cases of 3 mm skin biopsy punches achieved it by three months. For other skin biopsy punch sizes, 90% of 2 mm, 75% of 4 mm and 63.64% of 5 mm achieved grade 0 by 3 months.

On statistical analysis, Chi-square tests showed significant associations between punch size and complications ($\chi^2 = 9.52$, $p = 0.049$). Fisher's exact test showed significant association between suturing and complications ($p = 0.0028$). No significant associations were observed for the procedure type, sex, age group, site of lesion or diagnosis of the lesions (Table 2).

DISCUSSION

Skin biopsy punch is a versatile instrument used for diagnostic, therapeutic and cosmetic purposes.[1] Many indications of skin biopsy punch have been mentioned by Hurkudli et al.[1] and AlGhamdi et al.[9], but due to the limited time period, unavailability of power punches and lack of facility at our center for follicular unit extraction, our study was limited to nineteen indications only. Consistent with our results, overall complications were predominantly minor, and no postoperative infections were observed. Importantly, larger punch size and suturing were statistically associated with higher overall complication rates (Table 2)

In our study, the most common immediate complication was "dog ear" defect which occurred in 17.86% cases. It occurred in all cases of scrotal calcinosis (8.93%). In these cases, the defect occurred even on using skin punch of 2 mm, likely due to the redundant skin that remained after surgery of the scrotal skin. However, these defects were resolved on the first follow-up. Dog-ear defect is an excess of tissue formed during skin closure. This defect occurs in skin when its elastic properties have been exceeded, or the wound is closed under excessive tension. Its chances are high when the angle formed at the intersection sides of wound is more. The wound formed with skin biopsy punch has a circular apical angle, with more or less equal length and width. This defect can occur when the ratio of length to width of wound is less than 3:1.[7] While using skin biopsy punch, dog ear defect can occur over face when the punch is greater than 3.5 mm in size.[9] These observations emphasize the role of closure tension and defect geometry in early contour changes.

After one week, SWD occurred in 23.21% of cases. Among them, 84.62% occurred over face. This could be due to suture removal time, as most of the sutures over face were removed on the sixth or the seventh day. Owing to the circular apical angle it may be logical to wait for a longer time to remove sutures from the face. After one month, SWD occurred in 28.57% cases. The most common site of SWD was trunk (37.50%) followed by upper limbs (31.25%) and face (12.50%). SWD didn't occur after one month, as they generally occur 4-14 days after surgical procedures.[10]

In a study done by Wahie et al.[11] of dermatology inpatients undergoing diagnostic skin biopsies, SWD occurred in 7% of cases following diagnostic biopsies. In this study 5 out of 7 cases of SWD were also associated with infection. In a study done by Seyffert et al.[8] which studied SWD after cutaneous excision, SWD occurred in 0.55%. However, there was no mention of punch excision and SWD, but they found an increased chance of SWD with increasing age, presumed infection, bleeding and wounds located over distal extremities. Compared with these studies of diagnostic biopsies[11] and excisions,[8] our therapeutic skin punch biopsies cohort showed a higher proportion of dehiscence but no infection, bleeding, hematoma, discharge, or tissue breakdown.

SWD is caused by minimal tensile strength at the time of suture removal. When comparing a surgical wound with normal skin, the collagen reaches 3% tensile strength after 1 week, 20% after 3 weeks and 80% by one year.[8] In our study, the cause of SWD was most likely, the circular shape of skin punch. Even after stretching the skin perpendicular to the lines of the least tension an incision analogous to an elliptical incision could not be made. The curved, rather than the pointed end minimized the tensile strength and affected wound healing. In our study, in spite of being the most common complication after one week and one month, SWD is not the most common complication following most cutaneous surgeries. The most common

complication is infection.[8,11,12] By contrast, our study showed no postoperative infections, likely reflecting small, clean wounds and aseptic technique.

After one month, PIH occurred in 19.64% cases, among which 90.91% were present over the face. This suggests increased pigmentation in response to sunlight.[13] Atrophic scars occurred in 5.36% cases. It could be a part of normal wound healing.[14] Hypertrophic scars occurred in 3.57% cases. They typically occur three to four weeks after provocative stimulus.[15] There was one case of partial recurrence of compound nevus, which could have been mitigated by taking skin punch of larger size which would ensure complete removal as suggested by Tursen et al.[16]

After three months of procedures, PIH and hypertrophic scars occurred in 8.93% cases. Other complications were atrophic scars (5.36%) and hyperkeratosis (3.57%). According to Kumar et al.[12] late complications after skin biopsy were hypopigmented, hyperpigmented, atrophic or hypertrophic scars. In our study, we encountered all these scars. In our study, both the cases of corn developed hyperkeratosis. It may have occurred due to the physiological response of the skin to increased pressure.[17] There was no pain in both of the cases. So, after enucleation of corn, patients should be advised to reduce pressure on the area to limit thickened skin.

A study done by Yasui et al.[18] showed postoperative bleeding as the most common complication after surgeries with skin punch. We didn't encounter this problem, even with NHET. This could also be due to the fact that we checked the bleeding profile of all the patients before enrolling in the study. Other complications encountered by them were wound infection, surrounding skin damage, and vagal reflex.

SWGS is mostly used to grade the severity of post-operative wound infection. A study done by Tiwari et al.[19] showed that severity of post-operative wound infection increased from grade I to V of SWGS. In our study, there were no cases of post-operative wound infection. This could be due to small wound size, aseptic precautions and prophylactic antibiotics.

In our study, after one week, 67.86% cases had grade IC i.e. normal healing with mild erythema. After one month, 35.71% cases had grade IC and after three months 23.21%. On average, scar erythema persists for seven months after excision of lesions.[20] It could also be due to the size of punches as larger skin punches had more grade IC after 3 months. Also, procedures like NHET, which involve extensive tissue loss, and more manipulation had grade IC in half of the cases after three months.

After one week, 12.50% cases had grade IA i.e. normal healing with some bruising and 1.78% cases had grade IIC i.e. erythema plus other signs of inflammation along wound. Grade 0 i.e. normal healing increased with subsequent follow-ups. After one week, one month and three months 17.86%, 64.29% and 76.79% cases had grade 0 respectively (Figure 1). Longitudinal SWGS grading in our cohort demonstrated progressive improvement with no grade IV–V at any follow-up, consistent with clean, minor procedures.

This study has several limitations. It was a single-center study, which may limit the generalizability of the findings. Also, only a few skin conditions were treated with five procedures. Multi-center studies could broaden expertise and indications. Non-probability consecutive sampling at the lesion level with clinician determined eligibility may have introduced selection bias. Some follow-ups relied on photographs sent using messaging applications, which might have caused information/observer bias despite review by two dermatologists. All the diagnostic procedures were excluded, which may have limited the complications to few. The small sample size and absence of a control group also limit the strength of the study.

CONCLUSION

Therapeutic skin punch biopsies appeared safe in our study, with predominantly minor complications and no postoperative infections. Larger punch size and suturing were statistically associated with more complications. Accordingly, it is important to be careful in punch selection and tension reducing closure. These findings support careful procedure planning, and patient counselling.

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