Original Article

Outcomes Following Primary Excision of Ocular Surface Squamous Neoplasia at a Tertiary Eye Care Centre in the Midwestern Region of Nepal

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ABSTRACT

Introduction: Ocular surface squamous neoplasia (OSSN) includes variety of tumours ranging from mild epithelial dysplasia to invasive squamous cell carcinoma. Squamous lesions of conjunctiva and cornea are important clinical entities due to potential risk of significant ocular and even systemic morbidity and mortality.

Objective: To determine demographic profile, clinical presentation, histopathological features, and surgical outcomes of OSSN.

Methodology: This hospital-based, retrospective, observational study was conducted from 2021 July to 2025 April after ethical approval among all consecutive patients diagnosed with biopsy-proven OSSN at Rapti Eye Hospital. Main outcomes examined included demographic profile, clinical presentation, histopathological features, and surgical results, including complications and recurrence.

Result: A total of 36 eyes of 35 individuals with mean age 46.51±16.44 (range: 10-84) years were included. Male predilection (63%) was observed. Unilateral presentation was seen in 97% and bilateral involvement in one case with Xeroderma Pigmentosa. Nasal bulbar conjunctiva was involved in 25 out of 36 eyes (69.4%). All 36 eyes were treated with surgical excision followed by histopathological examination. All patients were followed up for two years. Conjunctival intraepithelial neoplasia (CIN) III was the most common finding histologically, with 11 (30.5%) patients, followed by benign lesions in 10 (27.8%) patients. Six patients had CIN II, with the lowest number of cases. Surgical margins were involved in 10 (27.8%) patients who underwent further adjuvant chemotherapy with topical Mitomycin-C (MMC). Only one (2.8%) out of 36 eyes had recurrence. Post-operative complications were seen in two (5.6%) cases. Thin sclera was observed in one case, and punctal stenosis occurred in one case that received MMC post-operatively.

Conclusion: In current study, the demographic profile showed OSSN being more common in the middle age group with male predilection. The overall prognosis of surgical management of OSSN with margin clearance is fairly good, with a low recurrence rate and adverse effects.

Key words: Amniotic membrane graft; conjunctival intraepithelial neoplasm; ocular surface squamous neoplasia.

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INTRODUCTION

Ocular surface squamous neoplasia (OSSN) includes a variety of ocular surface tumours ranging from mild epithelial dysplasia to invasive squamous cell carcinoma. The OSSN is one of the most frequent non-pigmented malignancies of ocular surface (Tsatsos et al., 2025). Squamous lesions of conjunctiva and cornea are important clinical entities due to potential risk of significant ocular and even systemic morbidity and mortality (Basti et al., 2003). Lee and Hirst proposed the term ocular surface squamous neoplasia (OSSN) to encompass entire spectrum of dysplastic and carcinomatous lesions of ocular surface (Lee et al., 1995).

The OSSN lesions can simply be classified as benign, pre-invasive or invasive (Basti et al., 2003). The average incidence of OSSN varies from 0.13/100,000 to 3.5/100,000 population (Lee et al., 1992; Sun et al., 1997; Templeton, 1967). It is usually unilateral, affecting individuals after sixth decade of life. Important risk factors include exposure to ultraviolet radiation, cigarette smoking, human papillomavirus (HPV) infection, chemicals such as trifluridine, vitamin A deficiency, and Xeroderma Pigmentosum (Armstrong et al., 2001; Basti et al., 2003). The OSSN usually presents as a greyish-white elevated conjunctival lesion at or near limbus with a characteristic tuft of blood vessels in interpaplebral region. The management of OSSN involves surgical resection using “no touch” technique with or without nonsurgical therapies, including topical chemotherapy (mitomycin C, 5-fluorouracil), topical/injection immunotherapy (interferon alpha-2b) (Balint, 1998). Plaque brachytherapy is effective and well-tolerated modality for management of patients with ocular surface malignancy with evidence of localised corneoscleral invasion (Walsh-Conway et al., 2009).

Incidence of OSSN is increasing in developing countries, and data regarding these lesions are very rare in this part of the world. So this study was planned to determine the demographic profile, clinical pattern, histopathological characteristics, and surgical outcomes of OSSN at the tertiary eye care centre of Midwestern Nepal.

METHODOLOGY

This was a hospital-based, retrospective, observational study conducted in Rapti Eye Hospital, a tertiary eye care centre in the Midwestern region of Nepal. This study followed the international norms and the tenets of the Declaration of Helsinki. Approval for the study was obtained from the ethical review board of National Health Research Council before (Reference number: 2770).

All consecutive cases with biopsy-proven OSSN in the cornea department from 2021 July to 2025 April were included in the study. Main outcome measures were demographic profile, clinical presentation, histopathological characteristics and surgical outcomes, including complications and recurrence following primary excision of OSSN.

The diagnosis of OSSN was made based on characteristic clinical features (leukoplakic, gelatinous, or papillomatous limbal mass) supported by anterior segment Optical Coherence Tomography (OCT) in all cases.

Information regarding age, gender, symptoms and signs, surgical details and histopathological report was noted. Surgical excision was performed in all cases as the primary modality of treatment.

A "no-touch" technique was used to excise OSSN lesions (Shields et al., 1997). Conjunctival incision was made 4 mm outside the clinically determined tumour margin, incorporating the full thickness of the conjunctiva and Tenon's capsule. Absolute alcohol was then applied to the cornea to loosen the epithelium from the basement membrane, and then rinsed off with copious irrigation after 40-45 seconds. All involved corneal epithelium with 2 mm of clear cornea outside the visible lesion and any associated corneal pannus was then scraped off with a keratome. Then, using a double freeze-thaw technique, cryotherapy was applied to the conjunctival edges involved limbal zone. Bare scleral bed cryotherapy (triple freeze and thaw technique) was also applied to the limbus when tumour was found adherent to the episclera or sclera. Excision was followed by direct closure or closure with autologous graft or with amniotic membrane graft, depending upon the size of the lesion. The specimen was then put in the filter paper with markings as medial, lateral, superior and inferior margins.

The excised specimen was then sent for histopathological analysis. Post-operatively, patients were prescribed antibiotic and steroid drops for six weeks along with tear supplements. Patients were analysed according to histopathological reports, follow-up pattern, and recurrence.

The Mitomycin-C (MMC) 0.04% four times a day was started on all patients with histopathologic evidence of margin positivity in Conjunctival intraepithelial neoplasia (CIN) III lesions or invasive squamous cell carcinoma (SCC). The MMC was started on a "one week on" and "one week off" basis and was given for four cycles according to Will's Eye Hospital protocol. All patients were then followed up at intervals of one month, six months, one year, and two years.

Data were collected from the medical records and cleaned in Microsoft Excel Sheet. Statistical analysis was done using IBM SPSS Statistics version 20 (IBM Corp., Armonk, N.Y., USA).

RESULT

A total of 35 cases (36 eyes) were enrolled in the study and analysed. The mean age of the patients was 46.51±16.44 years. The majority of patients belonged to the age group 15-40 years, 14 cases (40%). Males (63%) were affected more than females with a ratio of 1.69:1. The age distribution of study participants has been tabulated (Table 1). Almost all cases were unilateral, 34 (97%), except one case of Xeroderma Pigmentosum, which had bilateral involvement. The 97% of the lesions were unilateral, involving RE in 16 cases and LE in 18 cases, except one case of Xeroderma Pigmentosum with bilateral involvement. 25 out of 36 eyes (69.4%) had nasal, nine (25.0%) had temporal involvement, and two (5.6%) had inferior lesions.

All 36 patients were treated with surgical excision followed by histopathological examination. On histological examination, 10 (27.8%) patients had benign lesions, nine (25%)

patients had CIN I, six (16.7%) had CIN II, and 11 (30.5%) patients had CIN-III. Twenty six (72.2%) patients underwent surgical excision alone, and 10 (27.8%) patients who had margins involved in histopathological reports underwent further adjuvant medical management. None of the cases experienced complications during the surgery. One of the patients showed thin sclera, and one of the patients receiving MMC post-operatively showed punctal stenosis. One (2.8%) out of 36 eyes had recurrence.

Table 1: Age distribution of study participants.

Age group (years)	Frequency (Percent)
<15	1 (2.9)
15-40	14 (40)
41-60	13 (37.1)
>60	7 (20)
Total	35 (100)

Table 2: Lesion location.

Location	Number (Percent)
Nasal	25 (69.4)
Temporal	9 (25.0)
Inferior	2 (5.6)
Total	36 (100)

Table 3: Histopathological types.

Histopathological grade	Number (Percent)
Benign	10 (27.8)
CIN-I	9 (25.0)
CIN-II	6 (16.7)
CIN-III	11 (30.5)
Total	36 (100)

Table 4: Treatment details and outcomes.

Parameters	Number (Percent)
Treatment	
Surgical excision	26 (72.2)
Surgical excision+ MMC	10 (27.8)
Complication	
Yes	2 (5.6)
No	34 (94.4)
Recurrence	
Yes	1 (2.8)
No	35 (97.2)

DISCUSSION

The mean age of this study participants was 46.51 years, with an age range from 10 to 84 years. This finding is similar to previous studies from South Asia, which also reported OSSN in younger populations (Dandala et al., 2015; Patel et al., 2019; Shrestha et al., 2020). In contrast, Lee et al., (1995) have reported the average age of occurrence of OSSN to be 56 years (range 4-96 years). Another recent study with United States data has reported a mean age of 67 years and 88% of cases occurring in individuals older than 50 (Meide et al., 2025). The younger presentation may be attributed to factors like Ultraviolet (UV) Radiation exposure, the increased prevalence of human immunodeficiency virus (HIV) in these regions and genetic predispositions. Literature has previously reported the occurrence of OSSN at a younger age in patients with HIV infection (Gichuhi et al., 2015) and Xeroderma Pigmentosum (Sivalingam et al., 1990). In present study, there was one case of Xeroderma Pigmentosum presenting at 10 years of age, a known risk factor for bilateral and early presentation of OSSN.

There was a male preponderance, making 63% of total cases (Dandala et al., 2015; Patel et al., 2019; Shrestha et al., 2020). This could be attributed to greater exposure of males to UV radiation due to their involvement in more outdoor work (Gupta, 2019; Shields et al., 2004; Walsh-Conway et al., 2009). Similarly, 63.8% cases were male, indicating male preponderance similar to the study by Miede et al., (2025). Regarding laterality, OSSNs are usually found to be unilateral (Lee et al., 1995). In present study, 97% of cases were unilateral, except one case of Xeroderma Pigmentosum, which had bilateral involvement. Also nasal conjunctiva was the most common location in this study due to the fact that UV radiation that hits the temporal cornea is refracted and concentrated on the nasal limbus (King-Smith et al., 2020). Additionally, the incident temporal sunlight is focused nasally with a 20-fold magnification in intensity according to previous studies (Coroneo, 2011).

All of present study participants underwent wide excision with cryotherapy (with conjunctival autologous graft or with Amniotic Membrane Graft (AMG). Topical Mitomycin C 0.04% was prescribed to 10 cases due to positive margins. Recurrence rates following excision of OSSN alone range from 5–69% (Erie et al., 1986; Nanji et al., 2014; Pe'er, 2015) and after excision combined with cryotherapy, range from 7.7–11.5%. In current study, recurrence occurred in only one patient, resulting in a rate of 2.8% over a two-year period.

In this study, CIN III was the most common type of presentation, accounting for 30% of cases, followed by benign lesions in 27.8% cases. Similar histological findings were seen in studies by Patel et al. (2019) and Shrestha et al. (2020).

Commonly encountered surgical complications include dellen, scleral melt, corneal thinning, recurrence, etc. (Gurnani and Kaur, 2025). In this study, one of the patients presented with thin sclera post-operatively and one of the patients presented with punctal stenosis as a result of topical MMC application. This shows that adjuvant chemotherapy with Mitomycin-C has a lower rate of recurrence without serious complications, which has been suggested by previous studies (Hirst, 2007). Studies have shown that surgical excision alone may not be sufficient to manage all cases of OSSN, particularly margin-positive cases. These cases have a better prognosis with adjuvant chemotherapy. In developed countries, immunotherapy with IFNα-2β has been used over MMC because of a favourable safety and tolerance profile (Karp et al., 2001; Meide et al., 2025; Vann and Karp, 1999). However, surgical treatment remains a mainstay in the management of Ocular Surface Squamous Neoplasia, particularly in resource-limited settings in rural Nepal. It helps determine pathological diagnosis and avoids non-compliance that might be associated with topical agents. Surgical management of OSSN with perfect margin clearance has a very low recurrence rate with a fairly good prognosis (Gurnani and Kaur, 2025).

Although adjuvant cryotherapy was applied to all excision margins, international guidelines (Galor et al., 2012) generally advise against routine use of topical chemotherapy for mild dysplasia once adequate cryotherapy has been performed. Our approach of limiting MMC to margin positive CIN III lesions or severe dysplasia aligns with these recommendations.

CONCLUSION

OSSN is more common among a relatively younger population in the Midwestern region of Nepal, with male predilection. Surgical management with cryotherapy has a fairly good prognosis when margins are clear on histopathology. Those with positive margins also benefited from the adjuvant chemotherapy with lower rates of recurrence and fewer side effects.

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