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ORIGINAL ARTICLE

# Loop Electrosurgical Excision Procedure in a Low-Resource Setting: Feasibility of Selective See-and-Treat Approach

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## Abstract

**Objectives** To assess the correlation between cervical smear, colposcopic findings and loop electrosurgical excision procedure (LEEP) histopathology and thereby assess the feasibility of performing LEEP bypassing cervical biopsy in selected cases.

**Methods** This is a retrospective study of patients who underwent LEEP at our institution from 2014 to 2018. We traditionally follow a three-step approach for detection and treatment of pre-invasive lesions of cervix—(1) pap smear, (2) colposcopy of abnormal pap smear cases and directed biopsy, and (3) treatment of abnormal biopsies with LEEP. LEEP was performed for cervical intraepithelial neoplasia (CIN) 2, CIN3, persistent CIN1 cases. Swede score $\geq$ 6 or major lesion on International Federation for Cervical Pathology and Colposcopy (IFCPC) scoring on colposcopy was considered to be suggestive of high-grade lesion.

**Results** Of the 123 patients who underwent LEEP, 80 patients had high-grade squamous intraepithelial lesion (HSIL) on cervical smear and swede score $\geq$ 6 on colposcopy. Seventy-seven (96.3%) of these patients had high-grade lesion on final histopathology. Avoiding cervical biopsy and proceeding with LEEP in these patients would reduce an additional procedure in 77 patients with overtreatment of only 3 patients (2.4%). Overtreatment rate was 3.2% when IFCPC scoring was used instead of Swede score.

**Conclusions** LEEP may be considered in patients with high-grade lesions on both colposcopy and cervical smear, bypassing cervical biopsy, thereby reducing the number of procedures performed. This reduces the financial burden for the individual and the healthcare facilities, also decreasing the anxiety and apprehension associated with multiple hospital visits and procedures.

**Keywords** Loop electrosurgical excision procedure · CIN · See-and-treat procedure · Colposcopy

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## Introduction

Cervical intraepithelial neoplasia (CIN) is the precursor lesion of carcinoma cervix and is histologically classified as CIN 1, CIN 2, or CIN 3. Widespread cervical screening using cytology combined with human papilloma virus (HPV) testing has resulted in a considerable increase in the number of women diagnosed with CIN in recent decades. As CIN 1 has high rate of regression and likelihood of progression to CIN 3+ is rare, patients with CIN 1 are usually monitored by continued follow-up. Excisional methods are primarily used to treat CIN 2 and CIN 3, where the rate of progression to invasive cervical cancer is high, if left untreated. This progression is relatively slow averaging 8–12 years for progression of CIN 2 to invasive cervical cancer. This prolonged natural history of premalignant stage offers opportunity to detect and treat precancerous lesions, thereby preventing progression to invasive cancer [1, 2].

Treatment of CIN includes excisional and ablative methods. Excision is considered to be superior to destruction, because it is possible to perform histological examination of the excised transformation zone (TZ), whereby the grade of abnormality can be determined more accurately and carcinoma ruled out. This also permits the calculation of dimensions of excised tissue and confirms the completeness of excision. The excision margin status (i.e. involved with CIN or not) and the size of the transformation zone will also be revealed [3].

Loop electrosurgical excision procedure (LEEP) was first described in 1989 by Prendiville. In view of shorter operative time, ease of performance, and low cost, LEEP is the most commonly used excisional method for CIN [4]. The entire transformation zone is excised using electrically activated tungsten wire loop electrodes, and the tissue obtained is used for histologic assessment of the disease and excised margins.

Bigrigg introduced the see-and-treat approach for patients with suspected CIN 3 at colposcopic examination [5]. In the see-and-treat procedure, patients undergo colposcopic examination and LEEP in a single sitting after a cytology report with cervical dysplasia, thereby omitting the colposcopic biopsy step. This procedure avoids false-negative colposcopic biopsy and reduces noncompliance of patients by decreasing the number of procedures and hospital visits and eases patient's anxiety [6]. LEEP was considered as a cost-effective procedure and also provides the chance of evaluation of the excised specimen [7]. Overtreatment was considered the main risk of this see-and–treat procedure, especially in patients with low-grade cervical dysplasias where the rate of regression was about 47% in 24 months [8].

## Materials and Methods

This is a retrospective study of patients who underwent LEEP at our institution from January 2014 to December 2018. In our institution, we follow a three-step approach for the detection and treatment of pre-invasive lesions of cervix. This includes:

(1) Pap smear
(2) Colposcopy of abnormal pap smear cases and directed biopsy
(3) Treatment of abnormal biopsies with LEEP

We used Bethesda terminology in the classification of cervical cytology. Colposcopy and LEEP procedures were performed by gynaecological oncologists, and pathologic specimens were evaluated by oncopathologists. Either a Swede score $\geq 6$ or a major lesion [according to International Federation for Cervical Pathology and Colposcopy (IFCPC) nomenclature] on colposcopy was considered to be suggestive of a high-grade lesion. LEEP was routinely performed for all CIN2 and CIN3 cases and for CIN 1 persisting for more than two years.

A detailed medical history was taken from each patient to exclude uncontrolled hypertension, diabetes mellitus, bleeding disorders, allergic reactions, pregnancy, and active genital tract infection. Each patient was counselled about the procedure and informed consent obtained. LEEP was carried out as an outpatient procedure under local anesthetic and colposcopic guidance. A speculum was used to expose the cervix, followed by application of 5% acetic acid and Lugol's iodine solutions to assess the lesion. Local anaesthesia was given by submucosal infiltration of 2% Xylocaine. Under colposcopic guidance, depending on the extent of the lesion, excision of the TZ was done in single or multiple passes. The excision was initiated peripheral to the area of non-uptake of iodine with appropriate size loop electrode. Bleeding was assessed based on the amount of blood loss and requirement of haemostatic agent intraoperatively. Haemostasis was obtained by the routine use of roller ball coagulation using 50 mV current. If this failed, Monsel's paste was applied. In case of persistent bleeding, packing was done with povidone iodine-soaked roller gauze. The excised specimens were sent for histopathological examination.

Routine course of oral antibiotics was prescribed post-procedure for all women. The women were informed about the possibility of experiencing mild cramps and blood-stained discharge in the following two weeks. They were advised to avoid sexual intercourse for 1 month after the procedure. They were advised to report if they experienced excessive bleeding, severe abdominal pain or cramps, or, foul smelling vaginal discharge.

Following LEEP, patients were followed up after 10 days with histopathology report and assessed for any complications. A cervical smear was done after 6–12 months, and patients with abnormal smear underwent repeat colposcopy and directed biopsy. Women were considered cured if there was no cytological or histological evidence of CIN at follow-up. Patients with persistent disease at follow-up were treated with repeat LEEP or hysterectomy.

Histopathology reports, colposcopic findings, details of procedure and complications were retrieved from medical records. Major complications were defined as those requiring further intervention or admission (severe bleeding requiring blood transfusion or hysterectomy, infection requiring parenteral antibiotics) and cervical stenosis. Mild pain and bleeding were classified as minor complications. Cure rates and complications were reported as frequency percentages. Cure rates categorized by age, menopausal status, type of LEEP, grade of CIN, extent of cervical lesion, involvement of the endocervical canal, and margin involvement were compared using Chi-square tests, and correlation was assessed using Spearman rho.

## Results

A total of 123 women underwent LEEP from January 2014 to December 2018. Of the 123 women, 14 women had a histopathology of CIN-1, 25 had CIN-2, and 74 women had CIN-3, 10 women had microinvasive carcinoma. The mean age of women was 54.4 years (range—38 to 69 years). Nine women (7.3%) were nulliparous; 114 (92.7%) were parous. Seventy-three women (59.3%) were pre-menopausal and 50 (40.7%) were post-menopausal.

The same grade of CIN was reported in 72.4% of cases; however, a higher CIN grade was found in 9.8% and a lower grade in 9.8% of LEEP samples compared with the punch biopsy results; 8.1% of LEEP samples had no evidence of CIN. The higher grade among the punch biopsy and LEEP specimen was taken as final histopathology.

### Correlation of pap smear and colposcopic-directed biopsy

Of the 116 patients with high-grade lesion on cervical smear, 99 (85.3%) had a punch biopsy result of high-grade lesion and 17 (14.7%) had low-grade lesion on histopathology.

### Correlation of Swede score and punch biopsy results

Of the 85 patients with Swede $\geq$ 6, 77 patients (90.6%) had high-grade lesion on colposcopic-directed punch biopsy and 8 (9.4%) had low-grade lesion.

### Correlation of IFCPC score and punch biopsy results

Eighty-six patients had major lesion on IFCPC scoring. Seventy-eight (91%) of these women had high-grade lesion on punch biopsy, and 8 (9%) had low-grade lesion.

### Cure rate

Of the 123 women who underwent LEEP, 108 reported for clinical follow-up after 6–12 months and were included in the cure rate analysis. At follow-up, 67 women were disease-free, i.e. overall cure rate of 62.03%. Of the 12 women with CIN 1 who underwent LEEP, 11 were cured (91.7%). For CIN 2, the cure rate was 81.8% (18/22). Of the 64 women with CIN 3, 38 women had no dysplasia at follow-up (59.4%) ($P$ = 0.001). Cure rates of CIN 1, 2 and 3 are enumerated in Table 1.

#### Factors influencing cure rates

Cure rate of CIN according to age, menopausal status, parity, area of cervix involved, margin status and type of LEEP is enumerated in Table 2.

Age, parity, menopausal status and type of LEEP did not have statistically significant influence on the cure rate of CIN, whereas the grade of CIN, area of cervix involvement and margin status had significant influence on cure rates. Area of cervical involvement greater than 75% was associated with a lower cure rate (63%) compared to involvement of cervix less than 25% (95.5%) and 25–75% (83.3%) ($p$ = 0.001). A positive margin of LEEP specimen was associated with lower cure rate compared to those with margins free of disease (33.3% vs. 82.5% $p$ = 0.001).

**Table 1** Cure rate of LEEP for CIN 1, CIN 2 and CIN 3

| | Number cured | Cure rate (%) | |
|---|---|---|---|
| CIN 1 | 11/12 | 91.7 | $p$ = 0.001 |
| CIN 2 | 18/22 | 81.8 | |
| CIN 3 | 38/64 | 59.4 | |

**Table 2** Cure rate of CIN according to age, menopausal status, parity, area of cervix involved, margin status and type of LEEP

| | Cure rate | *p* value |
|---|---|---|
| *Age (years)* | | |
| < 40 | 61.9% (13/21) | 0.068 |
| 41–50 | 73.2% (41/56) | |
| > 50 | 48.3% (15/31) | |
| *Menopausal status* | | |
| Premenopausal | 68.6% (46/67) | 0.187 |
| Post-menopausal | 56% (23/41) | |
| *Area of cervix involved* | | |
| < 25% | 95.5% (36/38) | **0.001** |
| 25–50% | 83.3% (20/24) | |
| > 50% | 63% (29/46) | |
| *Margin status* | | |
| Negative | 82.5% (64/78) | **0.001** |
| Positive | 33.3% (10/30) | |
| *Type of LEEP* | | |
| Single pass | 58.9% (43/73) | 0.119 |
| Multiple pass | 74.2% (26/35) | |

Bold values indicate the factors that have statistically significant influence on cure rate

### Complications

Patients who underwent LEEP were assessed for minor and major complications. Minor complications noted were pain (14/123), spotting per vaginum (13/123) and discharge per vaginum (12/123). There were no major complications requiring intervention or hospital admission.

## Co-relation of cervical smear and LEEP histopathology

Co-relation of cervical smear with LEEP histopathology is enumerated in Table 3. Of the 123 women, cervical smear was atypical cells of undetermined significance (ASCUS) in 3, low-grade squamous intraepithelial lesion (LSIL) in 13, HSIL in 97, atypical squamous cells—high grade cannot be ruled out (ASC-H) in 4, negative for intraepithelial lesion or malignancy (NILM) in 2, squamous cell carcinoma (SCC) in 4 women. Comparing the cervical smear with the final histopathology, it was observed that of the 116 patients with high-grade lesion (HSIL, ASC-H) on cervical smear, 102 patients (87.9%) had high-grade lesions on histopathology (Spearman rho 0.24).

## Co-relation of colposcopy and LEEP histopathology

On colposcopic examination, type 1 transformation zone (TZ) was present in 31.7% (39/123), type 2 TZ in 14.6% (18/123), type 3 TZ in 53.7% (66/123).

### Swede score and LEEP histopathology

Swede score was less than 6 in 38 women and score greater than or equal to 6 was present in 85 women. Of the 85 patients with Swede $\geq$ 6, 82 patients (96.4%) had high-grade lesion on histopathology (Spearman rho—0.43). Table 4 shows the co-relation between Swede score and LEEP histopathology.

### Co-relation of smear, Swede colposcopic scoring and LEEP histopathology

Co-relation of smear, Swede colposcopic scoring and LEEP histopathology is enumerated in Table 5. Eighty women among the 123 had a HSIL on cervical smear and a Swede scoring of $\geq$ 6. Of these 80 women, the final histopathology was high grade in 77 women (96.3%) and low grade in 3 (3.8%).

### Co-relation of cervical smear, IFCPC colposcopic scoring and LEEP histopathology

Of the 123 women, 81 women had a smear of HSIL and a major (grade 2) lesion on colposcopy according to IFCPC terminology. Of these 81 women, the final histopathology

**Table 3** Co-relation of cervical smear and LEEP histopathology

| | Smear | | Total | Spearman rho |
|---|---|---|---|---|
| | Low grade | High grade | | |
| *HPR* | | | | |
| Low grade | 3 | 14 | 17 | 0.24 |
| High grade | 4 | 102 | 106 | |
| Total | 7 | 116 | 123 | |

**Table 4** Co-relation of Swede score and LEEP histopathology

| | Swede score | | Total | Spearman rho |
|---|---|---|---|---|
| | < 6 | ≥ 6 | | |
| *HPR* | | | | |
| Low grade | 12 | 3 | 15 | 0.43 |
| High grade | 26 | 82 | 108 | |
| Total | 38 | 85 | 123 | |

**Table 5** Correlation of cervical smear,Swede colposcopy scoring and LEEP histopathology

| Final HPR | No. of patients | Percent |
|---|---|---|
| Low grade | 3 | 3.8 |
| High grade | 77 | 96.3 |
| Total | 80 | 100 |

was high grade in 77 women (95.1%) and low grade in 4 (3.2%).

## Discussion

Overall cure rate of CIN in our study was 62.03%. The cure rate for CIN-1 was 91.7%, 81.8% for CIN-2 and 59.4% for CIN-3. Age, parity, menopausal status and type of LEEP did not have statistically significant influence on the cure rate of CIN. Area of cervical involvement greater than 75% and positive margin of LEEP specimen was associated with lower cure rate. There were no major complications requiring intervention or hospital admission in our study.

96.3% of women with HSIL on cervical smear and a Swede scoring of $\geq 6$ had high-grade lesion on final histopathology. Avoiding cervical biopsy and proceeding with LEEP in these patients would reduce an additional procedure (of cervical punch biopsy) in 77 patients with overtreatment of only 3 patients (2.4%).

95.1% of women with HSIL on cervical smear and a major lesion on IFCPC scoring had high-grade lesion on final histopathology. Avoiding cervical biopsy and proceeding with LEEP in these patients would reduce an additional procedure in 77 patients with overtreatment of 4 patients (3.2%).

Estimated overtreatment rates in our study based on colposcopic findings (Swede score and IFCPC scoring) in patients with high-grade abnormality on r were 2.4% and 3.2%, respectively. Overtreatment rates of 23% have been reported when LEEP was performed for all high-grade smears [9]. See-and-treat approach based on VIA has reported overtreatment rates of 12.5% [10]. Studies have reported an overtreatment rate of 10–12% when smear and colposcopic findings were used to select patients for LEEP [11]. Due to high specificity of r for high-grade lesions, see-and-treat approach in patients with HSIL and ASC-H reduces overtreatment rates [12–15].

## Conclusion

LEEP has acceptable cure rates with minimal complications. Larger lesions and positive margins were associated with lower cure rates. Although single visit approach is acceptable in community-based programmes, in tertiary care settings where the standard three-step approach is used, shifting to a selective see-and-treat approach reduces the burden without inadvertently increasing overtreatment rates. This reduces the financial burden for the individual and healthcare facilities and decreases the anxiety and apprehension associated with multiple hospital visits and procedures.

### Compliance with ethical standards

**Conflict of interest** The authors declare that there are no conflicts of interest.

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