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ORIGINAL ARTICLE

The Diagnostic Efficacy of Swede Score for Prediction of Pre-invasive Cervical Lesions: A Prospective Hospital-Based Study

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Abstract

Context The accuracy of colposcopy has recently been called into question particularly with regard to determining the site requiring biopsy. The technique of colposcopy is largely operator dependent, and the agreement between colposcopists is less reliable than once presumed. In an attempt to standardize colposcopy a new scoring system, the Swede score has been devised, which includes lesion size as a variable to be scored in addition to the 4 variables found in the modified Reids Colposcopic Index (RCI).

Aim To assess the diagnostic accuracy of Swede score for pre-invasive cervical lesion.

Setting and Design A cross-sectional study in a tertiary care centre.

Method Swede score was calculated for assessment of pre-invasive cervical lesions on patients undergoing colposcopy who were suspected with pre-invasive cervical lesion. Cervical biopsy was taken if modified RCI ≥ 3 or Swede score ≥ 5. Histopathology report of the cervical biopsy was taken as gold standard.

Results Swede scores of 5 or more had sensitivity, specificity, positive and negative predictive values of 94.9%, 88.4%, 75.5% and 92.9% respectively.

Conclusion The Swede score by just incorporating one additional variable that is size of the lesion, showed better correlation with histopathology.

Keywords Swede score · Colposcopy · Pre-invasive · Cervical lesion · Efficacy

Introduction

Carcinoma cervix is one of the most common malignancies among female genital tract in India. Owing to its long pre-cancerous stage, prevention of cervical cancer can be done using various screening modalities such as Pap smear, liquid-based cytology (LBC), HPV DNA testing, visual inspection with acetic acid (VIA), visual inspection with Lugol's iodine (VILI), and colposcopy. Although the Pap smear is still the undisputed screening test in most programmes to prevent cervical cancer, numerous studies could demonstrate that the sensitivity of a single Pap smear for cervical intraepithelial neoplasia (CIN) 2/3 is much lower than conceived previously. The sensitivity as shown by a meta-analysis has been found to be less than 60% after a single Pap smear [1]. However, any screening modality will be successful only if appropriate methodologies for confirming the diagnosis and infrastructure for proper management are available. Biopsy of screening test positive population is the gold standard method to confirm the diagnosis. Taking biopsy of all screen test positive population will require a lot of man power in terms of trained pathologist and will incur a great burden on pathology laboratory. Therefore, the screen positive population needs to be triaged with the help of a modality which will narrow down our intervention to a population which actually requires it.

Colposcopy is the unchallenged standard for evaluating cervical abnormalities. Colposcopic evaluation and guided biopsy are important diagnostic steps in standard

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management for abnormal findings on cervical smear and picks up the maximum number of cases of premalignant lesions [2]. It reduces both under treatment and overtreatment. Colposcopy and if needed directed biopsy picks up the maximum number of cases of premalignant lesions [3]. The modified RCI (Reid Colposcopic Index) is most widely used scoring system for colposcopy, and it consists of four parameters (colour of acetowhite area, acetowhite lesion margin and surface configuration, appearance of blood vessels and pattern of iodine staining) that are graded 0, 1 or 2. The sensitivity of RCI for any lesion detected between 56 and 89%. The specificity for low-grade lesion was lower at 57.5% and 92.9% for high-grade lesion.

The accuracy of colposcopy has recently been called into question particularly with regard to determining the site requiring biopsy. The technique of colposcopy is largely operator dependent, and the agreement between colposcopists is less reliable than once presumed. There can be considerable interobserver variability, and factors such as previous knowledge of referral cytology will affect diagnostic accuracy [4].

In an attempt to standardize colposcopy, Shaw et al. and Strander et al. have devised a new scoring system, the Swede score [5]. This includes lesion size as a variable to be scored in addition to the 4 variables found in the modified Reids Colposcopic Index. Considering the higher accuracy of this novel scoring system, its use can definitely improve the result of colposcopy and help in improved outcome of patient management. The aim of this study was to assess the diagnostic accuracy of Swede score for pre-invasive cervical lesion and to evaluate pre-invasive cervical lesion by Swede score.

Subject and Methods

A cross-sectional study was planned to predict the accuracy of Swede score for assessment of pre-invasive cervical lesions on patients undergoing colposcopy at Department of Obstetrics and Gynaecology. The data were collected for 1 year between July 2018 to June 2019, in women suspected with pre-invasive cervical carcinoma and who agreed to participate in the study.

Inclusion Criteria

Abnormal Pap smear (ASCUS or higher), with no gross lesion on the cervix of vagina, postcoital bleeding, naked eye examination reveals an unhealthy cervix suspicious of malignancy, especially with significant acetowhitening after acetic acid wash, a positive screening high-risk HPV DNA test.

Exclusion Criteria

Ongoing vaginal bleeding, any previous gynaecological examinations in last 1 week, obvious growth, previous procedures on cervix, e.g. excision biopsy, cryotherapy, conisation, etc., pregnancy, nulliparous, unsatisfactory colposcopy (inability to visualize whole transition zone), history of pelvic irradiation.

Following approval of the ethical committee and written informed consent from patients, the patients who met the inclusion criteria were enrolled in the study and data were collected using structured proforma. It included patients demographic detail, general and pelvic examination, and significant medical history. Swede score (Table 1) was calculated at the time of colposcopy. Cervical biopsy was taken if modified RCI ≥ 3 or Swede score ≥ 5. The Swede score had 2 cut-off values: 5 when a high sensitivity was aimed (to detect most lesions) or 8 when a high specificity was required (to diagnose CIN2+) [6]. The sensitivity to predict CIN2+ when the score was ≥ 5 was 100%, that is, all high-grade lesions were detected, and the specificity was 90% if the score was ≥ 8 [5]. Histopathology report of the cervical biopsy was taken as gold standard.

Procedure

The woman was placed in modified lithotomy position on examining table stirrups with the buttocks slightly over the end of the table after voiding urine. An instrument tray with essential instruments for colposcopy was placed beside the couch. After exposing the cervix, naked eye examination of cervix was done to assess the nature of the cervico-vaginal secretions and to look for any obvious

Table 1 Swede score

Aceto uptake	0 or transparent	Cloudy, milky	Distinct, opaque white
Margins and surface	0 or diffuse	Sharp but irregular, jagged, geographical satellites	Sharp and even, difference in surface level including "cuffing"
Vessels	Fine, regular	Absent	Coarse or atypical vessels
Lesion size	< 5 mm	5–15 mm or 2 quadrants	> 15 mm or 3–4 quadrants or endocervical undefined
Iodine staining	Brown	Faintly or patchy yellow	Distinct yellow

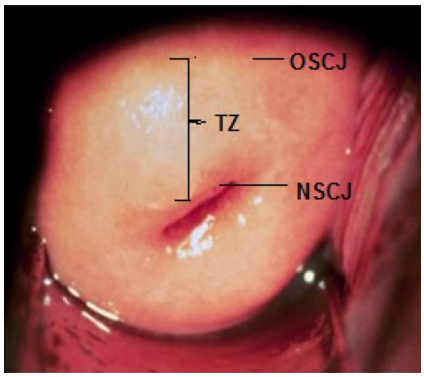

Fig. 1 No acetowhite area (normal cervix) (*OSCJ* original squamocolumnar junction, *NSCJ* new squamocolumnar junction, *TZ* transformation zone)

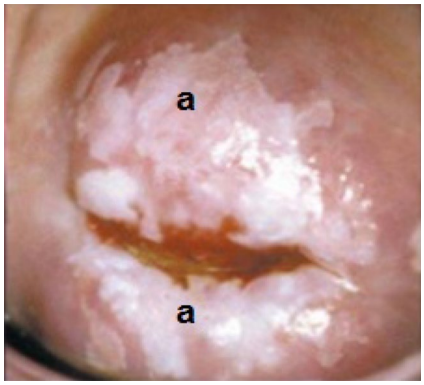

Fig. 2 Dense opaque acetowhite area (a) with sharp distinct margins

findings such as ectropion, polyp, nabothian follicles, transformation zone, atrophy, inflammation and infection, leukoplakia (hyperkeratosis), condylomata, ulcer, growth and any obvious lesions in the vaginal fornices. Following this, excess mucus was removed gently from the cervix with saline-soaked cotton swabs. Distal and proximal borders of the transformation zone were identified. The Colposcope used was BLT 9990Z digital video colposcope. Green filter was used to look for the vessels and findings noted. There after glacial acetic acid 5% dilute was applied with cotton soaked swab which was kept there for 1 min. Visualisation of cervix was done under 5 × and 10 × magnification, and findings were noted. (Fig. 1 shows normal looking cervix with no acetowhite area, and Fig. 2 shows dense acetowhite area with sharp distinct margins, respectively.) Lugol's iodine was applied after that and looked for areas of decreased uptake. (Fig. 3 shows normal iodine uptake, and Fig. 4 shows abnormal or negative iodine uptake.) Scoring of all the findings based on modified RCI score and Swede score were calculated. As measuring the

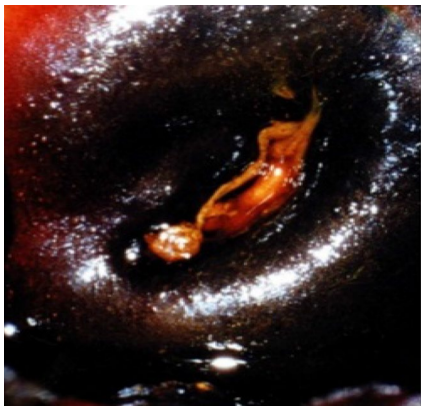

Fig. 3 Normal or positive iodine uptake after application of Lugol's iodine

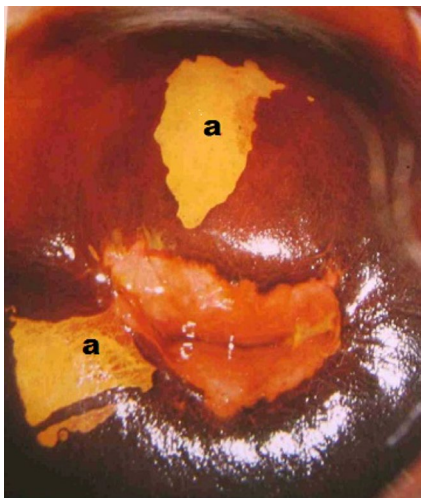

Fig. 4 Satellite lesions (a) do not stain with iodine after application of Lugol's iodine and appear as mustard yellow area

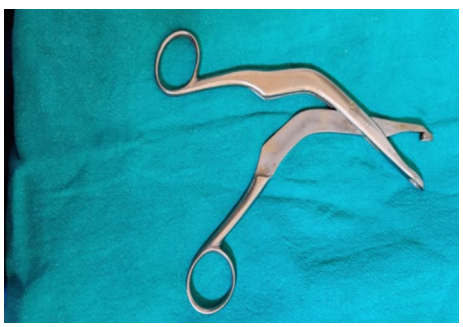

Fig. 5 Faure cervical biopsy forceps

Table 2 Distribution of patients according to indications for colposcopy

Indication for colposcopy	No. ($n=103$)	%
Unhealthy looking cervix	67	65.0
Abnormal cytology	27	26.2
Postcoital bleeding	5	4.9
VIA (visual inspection with acetic acid) positive	4	3.9
Total	103	

lesion size was technically difficult, a number of quadrants were taken for calculation of Swede score. Cervical biopsy was taken if modified RCI ≥ 3 or Swede score ≥ 5. The biopsy forceps that was used was Faure cervical biopsy forceps (Fig. 5). The biopsy sites were observed for continued bleeding, and Monsel's paste was applied if bleeding was excessive. Women were kept under observation for 3 h before sending them back. All biopsy samples were preserved in phosphate buffered formalin 10% and sent to Pathology department for histopathology reporting.

Statistical Analysis

The results are presented in frequencies, percentages and mean $\pm$ SD. The Chi-square test was used to find the association between categorical variables. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy Swede score were calculated. The p value < 0.05 was considered significant. All the analyses were carried out on SPSS 16.0 version (Chicago, Inc., USA).

Results

A total of 103 patients were registered and evaluated colposcopically by both modified RCI and Swede score. The mean age was 37.63 ± 6.71 with the majority of patients between 30 and 40 years (56.2%). More than half of patients got married between 20 and 25 years (66.7%) followed by < 20 (27.5%) and > 25 (5.8%) years. The mean age at marriage of patients was 21.23 ± 2.47 years. Majority of patients were multiparous (34.2%). Majority of patients were in monogamous relationship (98.3%). A total of 102 had undergone cervical screening for the first time during the study.

Unhealthy looking cervix (65.0%) was the most common indication (Table 2). While using Swede score to evaluate cervical lesion, more than half of the patients (57.3%) had normal colposcopy results, while 25 patients reported low-grade lesion (LGL) on colposcopy, while only 18.4% patients had high-grade lesion (HGL) based on colposcopy (Table 3). Total 44 cases had Swede score ≥ 5.

Table 3 Distribution of cases according to Swede score in the present study

Swede score	Colposcopic impression	No. ($n=103$)	%
0–4	Normal	59	57.3
5–7	LGL	25	24.3
8–10	HGL	19	18.4

LGL low-grade lesion, *HGL* high-grade lesion

Table 4 Distribution of cases according to histopathological reports of cervical biopsy (including both modified RCI and Swede score)

Histopathological report	No. ($n=56$)	%
CIN 1	12	21.4
CIN 2	14	25.0
CIN 3	8	14.3
Chronic cervicitis/benign	22	39.3
Total	56	

CIN cervical intraepithelial neoplasia

Table 5 Agreement between colposcopic impression according to Swede score and histopathological report of cervical biopsy

Colposcopic impression according to Swede score ($n=44$)	Histopathological report↓		
	Chronic cervicitis/benign ($n=11$)	CIN I ($n=12$)	CIN II + III ($n=21$)
LGL ($n=25$)	9	11	5
HGL ($n=19$)	2	1	16

LGL low-grade lesion, *HGL* high-grade lesion, *CIN* cervical intraepithelial neoplasia, κ (kappa statistics) = 0.761 (good level of agreement); $p < 0.001$

Cervical biopsy was taken for 56 patients (while using both modified RCI and Swede score), and its results are shown in Table 4.

Table 5 shows agreement between colposcopic impression according to Swede score and histopathology report of cervical biopsy. Out of 25 cases who were reported as LGL to Swede score, 11 cases came out to be CIN 1 and 5 cases were CIN2+. Twenty-one cases which were reported as CIN 2+ based on histopathology, and 16 cases had similar colposcopic impression according to Swede score. Using kappa statistics ($\kappa = 0.761$, $p < 0.001$), the colposcopic impression according to Swede score and histopathological report showed good level of agreement. Table 6 shows the validity parameters of Swede score for diagnosing low-grade and high-grade lesions.

Table 6 Validity parameters of Swede score for diagnosing low-grade and high-grade lesions. The sensitivity, specificity, positive predictive value and negative

S. no	Validity parameters	Percentage for LGL	Percentage for HGL
1	Sensitivity	95.2	94.9
2	Specificity	83.22	88.4
3	Positive predictive value	78.07	75.5
4	Negative predictive value	91.4	92.9
5	Inherent validity/accuracy	80.6	81.8

LGL low-grade lesion, *HGL* high-grade lesion

Discussion

In low-resource setting, it is generally recommended that screening should be initiated at age of 30 years to capture maximum cases of high-grade lesion with limited resources. The mean age of patients in the present study was 37.63 ± 6.71 years. It is comparable to the study conducted by Kuhn et al. in which mean age was 37 years [7]. In other study done by Joshi et al. in 2015, mean age was 34.5 year [8].

Retrospective inquiry about age of patients when exposed to coitus was made. All cases were married and had marital sex since early period of marriage. Early coitus increases the risk of cervical cancer two to four times as it increases the exposure to HPV [9]. Around two-third of patients got married between 20 and 25 years (66.7%) in the present study and the mean age at marriage/first coitus was 21.23 ± 2.47 years. Bhatla et al. (2004) reported a mean age at first coitus at 19 ± 3.3 years which was lower than our study population [10].

Parity influences chronic cervical lesions. Frequent coitus, poor sexual hygiene, repeated trauma due to frequent childbirths, cyclic variations in pH of vagina and increased risk of sexually transmitted diseases seem to be contributory factors added to early coitus. In the present study, 34.2% had parity three and 93.3% patients were multiparous (parity ≥ 2). Our study is comparable to R. Sankaranarayan et al. with 45.4% patients having parity 3 and 4 [11]. Bhatla et al. (2004) also reported high incidence of cervical lesion in multiparous women [10].

Most of the patients were not aware about cervical cancer risk factor and screening procedures. Out of 103 patients, 102 had undergone cervical screening for the first time during the study. This shows a low level of awareness about cervical cancer among general population and also a lack of regular and functional screening program. Only opportunistic screening of women for cervical cancer is being done in both public and private setups in North India.

In our clinical scenario, patients do not have good compliance so patients with unhealthy-looking cervix on clinical examination were directly referred to colposcopy without waiting for cervical cytology report. In the present study, unhealthy-looking cervix on clinical examination (65%) was the most common indication followed by abnormal cytology (26.2%). Abnormal Pap smear report was the most common indication in the study by Strander et al. [5]. This disparity could be explained by better cervical screening program and educational status of patient in developed countries contributing to regular follow-up and improved compliance.

More than half of the patients (57.3%) had normal colposcopy results, while 25 patients reported low-grade lesion on colposcopy based on Swede score. Only 18.4% patients had high-grade lesion based on colposcopy while using Swede score to evaluate cervical lesion. Kushwaha et al. showed a similar distribution of colposcopic findings using Swede score with 53.6% patients having normal colposcopic impression, 26.2% low-grade lesion and 20.2% as high-grade lesion [12].

In the present study, the Swede score showed good level of agreement with histopathology report. Ding et al. concluded that agreement between colposcopic diagnosis and cervical pathology matched perfectly in 89.2% cases and the strength of agreement was 0.698 ($p < 0.001$) [13]. Massad et al. concluded a poor (0.20) association between colposcopic impression and histology report, and the sensitivity and specificity of colposcopy were shown to be 89% and 52%, respectively [14]. The study concluded that colposcopy is useful in estimating grade of lesion, but confirmation of diagnosis and definitive management requires cervical biopsy. Strander et al. studied the performance of Swede score in colposcopy for detecting high-grade dysplasia in the uterine cervix. No high-grade lesion had a total score of less than five points [5]. A score of 5 points identified all high-grade lesions, and 8 points had a specificity of 90% in identifying CIN II and CIN III. In this study, it was found that it is safe to refrain from biopsy with a total colposcopy score of four or less. The specificity for a total score of eight or above was 90% which means that at this level the patient can be treated without preoperative biopsy ('see and treat') with a very modest rate of overtreatment. Using this scoring system, cervical biopsy was unnecessary in almost one half of the patients, reserving biopsy for score five to seven. In the present study, when Swede score ≥ 5 was chosen as the criteria for cervical biopsy, 44 patients (42.7%) underwent cervical biopsy and 33 cases (32.1%) of CIN were detected. Thus by using Swede score lesser number of cervical biopsy was indicated with a higher case detection rate.

Conclusion

We concluded that this scoring system is consistent, has a simple structure, and could possibly contribute to the education of colposcopists, thus enhancing the work of

preventing cervical cancer. Swede score by just incorporating one additional variable that is size of the lesion or number of quadrants involved showed better correlation with histopathology. Owing to high sensitivity and specificity of Swede score for high-grade lesion, this scoring method is a preferred method for treatment of high-grade CIN. In a low socioeconomic country like India, with limited resources for histopathology and also challenge for availability of well-trained oncopathologist, scoring system has much role to play. See-and-treat programs become feasible with efficient scoring system. Modified Reids Colposcopic Index with four parameters and total of 8 points were used in the initial days. With introduction of Swede scoring which is easy and with low learning curve, this can be adopted as a tool for diagnosis of CIN lesions.

The main strength of the present study is that all the colposcopies were done by a single colposcopist eliminating the interobserver variability. The main limitation of the study was that all patients were not biopsied, which is a gold standard, and biopsy was done only when the patients had modified RCI score ≥ 3 or Swede score ≥ 5 leading to verification bias.

Compliance with Ethical Standards

Conflict of interest There is no conflict of interest in the study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical clearance for this study was obtained from the Institutional Ethical Committee.

Human and Animal Rights Being a research involving human participants, all the ethical guidelines were followed.

Informed Consent Informed consent was taken from the patients.

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