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Research Article

A Comparative Study of Swede Score and Reid Colposcopic Index with Cervical Histopathology in Cervical Cancer Screening.

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Abstract:

The burden of cervical cancer in India, as well as all over the world is very high. Different screening modalities are available for early diagnosis during the precancerous stage making screening highly successful for cervical cancer[(1)]. Early intervention in cases picked up by screening can help to reduce the burden of the disease. Reid and Scalzi introduced the ***Reid colposcopic index (RCI)*** *for recording colposcopic findings and making colposcopic diagnosis less subjective, which is currently the most widely used scoring system.[(2,3)]The parameters used in RCI were aceto-whiteness, margins, vessel patterns and iodine staining; but this score did not consider lesion size. A new scoring system, the* ***Swede score,*** *has been devised by Strander et al.[(4)]In addition to the various parameters of Reid colposcopic index, it also incorporates lesion size as a fifth variable. We carried out this study to compare the two scoring systems taking histopathology as the gold standard. Both scores performed well in our study and the lesion size also corresponded with likelihood of harbouring high-grade lesions.*

Introduction

Worldwide 662,044 cases and 348,709 deaths were reported from cervical cancer in 2022.[(5)]It has a long precancerous stage during which early diagnosis can be made by various screening modalities.[(1)]Early intervention in cases picked up by screening can help to reduce the burden of the disease.

Various screening modalities utilized for cervical cancer screening include Pap smear, High-risk human papillomavirus (HPV) deoxyribonucleic acid testing, visual inspection with acetic acid (VIA), and visual inspection with Lugol's iodine (VILI). Colposcopy is employed to procure a guided biopsy in screen positive cases, representing a pivotal step for diagnostic confirmation. Given its inherent reliance on observer interpretation, colposcopy is susceptible to inter-observer variability. To mitigate subjectivity, Reid and Scalzi introduced the Reid colposcopic index (RCI), which stands as the most prevalent scoring system to date.[2,3] The RCI parameters encompass aceto-whiteness, margins, vessel patterns, and iodine staining, albeit lacking consideration for lesion size. Noteworthy is the RCI's sensitivity of 89% when detecting any lesion, decreasing to 56% with a high-grade lesion threshold, and specificity ranging from 57.5% for low-grade lesions to 92.9% for high-grade lesions.[3] Strander et al. devised the Swede score, a novel scoring system integrating lesion size

with the probability of harboring high-grade lesions.[4] The Swede score incorporates aceto-whiteness, margins and surface, vessels, lesion size, and iodine staining as its five variables, thereby enhancing diagnostic accuracy.

There is a scarcity of studies conducting a comparative analysis between the Swede score and Reid colposcopic index. This research endeavor was undertaken to juxtapose the two scoring methodologies using histopathology as the benchmark. A total of 60 female participants were recruited for this investigation following meticulous consideration of the predetermined inclusion and exclusion criteria.

Methodology

Women aged 30-65 years attending the Gynaecology Outpatient Department at a tertiary care center over a one-year period, with abnormal screening results such as positive visual inspection with acetic acid or visual inspection with Lugol's iodine, pap smear showing atypical squamous cells of undetermined significance (ASCUS) or worse, positive HPV deoxyribonucleic acid test, suspicious-looking cervix, women experiencing persistent discharge, postcoital or postmenopausal bleeding per vaginum, were enrolled in the study. Exclusions comprised patients with evident growth, prior cervical procedures (e.g., excision biopsy, cryotherapy, conization), pregnancy, unsatisfactory colposcopy, or a history of pelvic irradiation. Following a comprehensive explanation of the procedure to the participants, written informed consent was obtained. A thorough medical history was obtained, focusing on symptoms such as persistent vaginal discharge, abnormal uterine bleeding, and reproductive history. Additional information was gathered regarding the woman's referral tests or most recent cytological result, or testing for HR HPV. A general and systemic examination was conducted, including abdominal examination, local examination, speculum examination, and vaginal examination. This study is a prospective randomized controlled trial involving a total sample size of 60 women. The 60 patients with satisfactory colposcopy were assessed using the Swede score and Reid colposcopic index. Cervical biopsies were obtained from visually abnormal areas identified during colposcopy. In cases where no abnormal area was detected, a four-quadrant biopsy was performed. Endocervical curettage was carried out for all patients, and the samples were sent for histopathological evaluation. The Swede score and Reid Colposcopic Index were then compared with histopathology as the gold standard.

Procedure

Firstly, an examination using the naked eye via speculum was conducted. Observations such as nabothian follicles, atrophy, discharge, ectropion, leukoplakia, ulcer, growth, or any vaginal lesions were meticulously

recorded. Any excess mucus was delicately removed with saline-soaked cotton swabs. Subsequently, a colposcopy was carried out utilizing the advanced Promis digital video colposcope. To ensure a thorough colposcopy, it was imperative that all four quadrants of the cervix were clearly visible. Furthermore, both the distal and proximal borders of the transformation zone needed to be distinctly identified. The transformation zones were categorized as type 1, 2, or 3. Patients in whom the complete transformation zone or all four quadrants of the cervix were not adequately visualized were categorized as unsatisfactory colposcopy cases and hence, were excluded from the study. A green filter was then employed to scrutinize the vessels for any anomalous features. Subsequently, 5% acetic acid was applied using a cotton swab and left in place for 60 seconds. Following this, the cervix was scrutinized under magnification at 5x and 16x for any acetowhitening. Various characteristics such as sharpness, regularity, and cuffing were utilized to grade the margins of the atypical cervical epithelium. Following the application of Lugol's iodine, the margins and surface configuration of the lesions were meticulously examined and graded. Finally, for the Swede score calculation, the size of the lesion was determined using calipers within the colposcope. The Reid Colposcopic Index and Swede score were computed for each case. Biopsies directed by colposcopy from abnormal areas were obtained using punch biopsy forceps. In cases where no abnormal areas were identified during colposcopy, a 4-quadrant biopsy was performed. Endocervical curettage was conducted in all instances. Biopsy samples were preserved in 10% phosphate buffered formalin and sent to the pathology laboratory. Follow-up assessments were carried out with histopathological correlation with both the Swede score and Reid Colposcopic Index. The sensitivity and specificity of both scoring systems were meticulously compared.

TABLE 1 : REID COLPOSCOPIC INDEX[6]

Colposcopic sign	0	1	2
Colour	Shiny, snow white(semitransparent), area of faint whitening	Shiny, grey-white Intermediate white	Dull, opaque, oyster white; grey
Lesion size	Condylomatous or Micropapillary contour, indistinct borders, feathered or flocculated margins, jagged angular lesions,satellite lesions beyond the transformation	Regular lesions with smooth, straight outlines Sharp peripheral margins	Rolled, peeling edges. Internal borders between areas of differing appearance

Vessels	Uniform, fine calliper Randomly arranged patterns Non dilated capillary loops Ill defined areas of fine punctation or mosaic	Absence of surface vessels	Well defined coarse punctation or coarse mosaic Individual vessels dilated, arranged in sharply demarcated, well
Iodine staining	Positive iodine uptake, producing a mahogany brown colour Yellow staining by an area that is recognizable as a low-grade lesion by above criteria (<2/6)	Partial iodine Uptake variegated, Speckled appearance	Negative iodine uptake of a significant lesion,i.e yellow staining by a lesion already scoring three points or more on the first three criteria

TABLE 2 : SWEDE SCORE (4)

Score	**0**	**1**	**2**
Aceto uptake	None or transparent	Shady, milky	Distinct, opaque white
Margins/surface	Diffuse	Sharp but irregular, jagged, geographical satellites	Sharp and even, difference in surface level including "cuffing"
Vessels	Fine regular	Absent	Coarse or atypical
Lesion size	<5mm	5-15 mm or 2 quadrants	>15 mm or 3-4 quadrants or endocervical undefined
Iodine staining	Brown	Faintly or patchy yellow	Dinstict yellow

Statistical analysis

Data was collected according to the patient proforma. Data was entered in SPSS version 18.0. The Swede score and Reid colposcopic index were compared in this study by comparing the sensitivity, specificity, negative predictive value, positive predictive value and percentage of accuracy of the two scores, using histopathology as the gold standard. Also Receiver Operating Characteristic (ROC) curve was plotted and the most appropriate cut off values for both the scores were calculated.

Results

Women enrolled in this research varied in age from 30 to 65 years, with a mean age of 40.25 years. The majority of the participants (65%) had given birth three times or more. The most common complaint among women who tested positive on screening was vaginal discharge (38.3%). Out of the 60 patients involved in the study, 66.67% underwent colposcopy due to abnormal Pap smear results, 20% due to positive VIA or VILI tests, 5% due to HR HPV positivity, 5% due to the appearance of the cervix, and 3.33% due to abnormal uterine bleeding (postcoital and postmenopausal bleeding). All 60 patients underwent colposcopy and were assessed using the Swede score and Reid Colposcopic Index. The histopathological analysis of biopsy specimens from screen-positive patients revealed benign findings in 50% of cases, CIN 1 in 16.7%, CIN 2 in 6.7%, CIN 3 in 10%, and invasive cancer in 16.7%. A Swede score ranging from 0 to 4 was associated with benign or CIN 1 lesions. Among the 41 women with a Swede score of 0-4, 73.17% had benign histology and 24.39% had CIN 1 lesions. However, one woman with cancer had a Swede score of 0 and was not detected during colposcopy because the lesion was located endocervically (detected through endocervical curettage). A score of 5-7 was linked to CIN 2, CIN 3, or cancer. Among the 8 women with a Swede score of 5-7, 37.5% had CIN 2, 12.5% had CIN 3, and 50% had cancer. A Swede score of 8-10 was associated with CIN 2, CIN 3, or cancer. Among the 11 women with a Swede score of 8-10, 45.45% had cancer, 45.45% had CIN 3, and 9.09% had CIN 2. Of the 43 women with a Reid colposcopic index of 0-4, 69.76% had benign histology, 23.25% had CIN 1, and 4.65% had cancer. A score of 5-7 was correlated with CIN 2, CIN 3, or cancer. Among the 12 women with a Reid colposcopic index of 5-7, 25% had CIN 2, 33.33% had CIN 3, and 41.66% had cancer. A Reid colposcopic index of 8 was associated with CIN 3 or cancer. Among the 5 women with a Reid score of 8, 60% had cancer and 40% had CIN 3. Through the use of the ROC curve, the most suitable cut-off scores were determined for the Swede score and Reid Colposcopic Index (with a biopsy positivity threshold of CIN 2 or more severe lesions).This cut off value was found to be 4 for Swede score and 4 for Reid Colposcopic Index.(Figure 1)

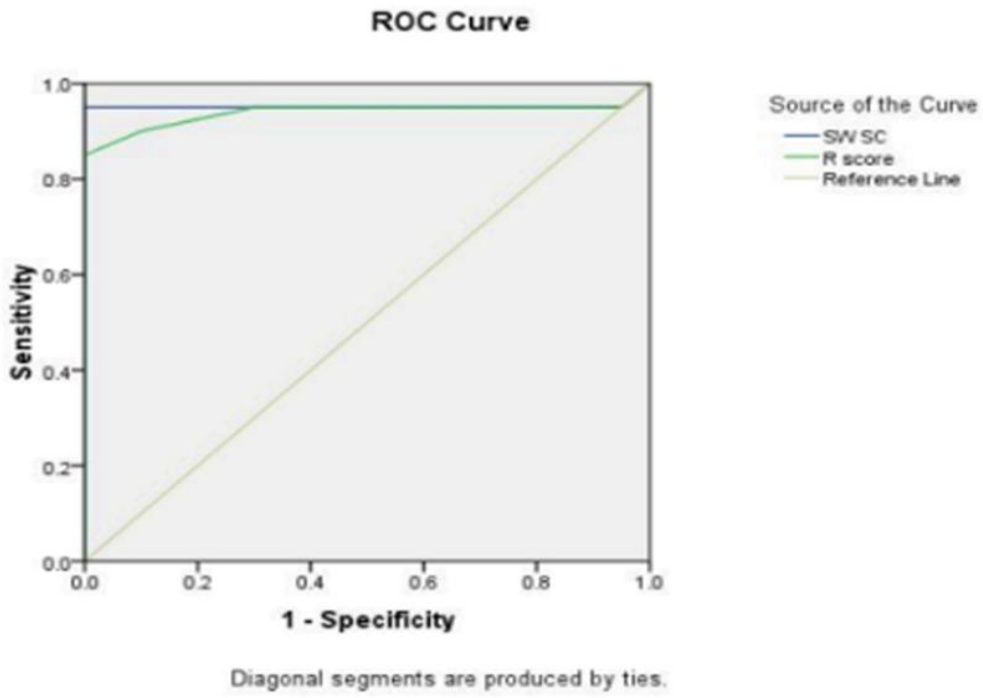

Figure 1: Receiver operating characteristic (ROC) curve for Swede score and Reid Colposcopic Index.

For a threshold of 4 in the Swede score, the sensitivity achieved a remarkable 95%, while the specificity reached a perfect 100%. The positive predictive value stood at a flawless 100%, with the negative predictive value at a commendable 98%. The overall accuracy of the Swede score was an impressive 98%. On the other hand, when utilizing a threshold of 4 for the RCI, the sensitivity attained a strong 85%, alongside a specificity of 100%. Both the positive predictive value and negative predictive value excelled at 100% and 93% respectively. The accuracy of the RCI was notably high at 95% according to Table 3. Notably, a statistically significant association was observed between the Swede score and histology ($p < 0.05$), as well as between the RCI and histology, further supporting the significance of these diagnostic measures.

TABLE 3 : COMPARISON OF SWEDE SCORE AND REID COLPOSCOPIC INDEX

	Sensitivity	Specificity	PPV	NPV	Accuracy
SWEDE SCORE	95%	100%	100%	98%	98%
RCI	85%	100%	100%	93%	95%

Lesion dimensions exceeding 15 mm or encompassing more than 3 quadrants were observed in 14 out of 60 female participants, constituting 23.33% of the cohort. Upon histological examination, CIN2+ lesions were detected in 20 individuals, among whom 65% (13 subjects) exhibited lesions measuring 15 mm or larger. A statistically significant correlation between lesion size and CIN2+ histology was established ($p < 0.05$).(Table 4)

TABLE 4 : ASSOCIATION OF CIN 2 OR WORSE LESIONS WITH HISTOLOGY

Score (Lesion size)	CIN 2 OR WORSE LESIONS ON HPE		Total	Pearson Chi-Square	p-value
	Positive	Negative			
0(<5mm)	1	16	17		
1(5-15mm)	6	23	29		
2(>15mm)	13	1	14		
Total	**20**	**40**	**60**	**30.172**	**<0.001**

Discussion

Since Strander et al. had determined that a Swede score ranging from 0 to 4 signified a benign or CIN 1 lesion with 100% specificity, they proposed that in these cases, biopsy could be omitted.[4] In the research conducted by Bowring et al., out of 200 women, 20 were identified with a Swede score of 0-4, yet surprisingly were diagnosed with high-grade lesions.[8] This prompted them to caution against the risk of overlooking high-grade lesions and advised against abstaining from performing biopsies when the Swede score falls within the 0-4 range. Conversely, in the investigation by Karrberg et al., the utility of the Swede score in reducing the necessity for diagnostic cervical biopsies was underscored. Their findings led them to affirm that none of those with a Swede score of 0-4 exhibited high-grade lesions, supporting the notion that biopsies were unnecessary in such instances.[9] Nessa et al. conducted a crossover randomized trial to assess the efficacy of the Swede score in women displaying acetowhite areas during Visual Inspection with Acetic acid.[10] A Swede score of 0-3 in this context was regarded as benign and did not undergo biopsy. In our own study, among the 41 women with Swede scores of 0-4, 30 individuals (73.17%) exhibited benign histology, while 10 women (24.39%) were diagnosed with CIN 1. There was one case where an endocervical lesion was overlooked during

colposcopy but detected during an endocervical curettage. Consequently, 97.57% of the biopsies aligned with the Swede scores, while 2.43% revealed a higher histopathology, indicating an underestimation. Based on our findings, we concluded that it would have been judicious to refrain from conducting biopsies for a total score of four or lower, encompassing 41 out of the 60 colposcopies (68.33%). Nevertheless, endocervical curettage should be performed in all instances where the screening results are positive, even if the Swede score is below four. In a study by Usmani et al., 57 VIA-positive women underwent colposcopic assessment followed by histopathological confirmation, revealing that for high-grade lesions, the Swede score exhibited greater sensitivity compared to the modified Reid index in VIA-positive women.[11]

In our investigation, all females with benign histology and CIN 1 exhibited RCI scores ranging from 0 to 4. Among those with CIN 2 histology, 25% had RCI scores of 0-4, while 75% had scores of 5-7. For individuals with CIN 3 histology, 66.67% had RCI scores of 5-7, and 33.33% had a score of 8. Among the women diagnosed with cancer, 20% had RCI scores of 0-4, 50% had scores of 5-7, and 30% had a score of 8. RCI scores below 4 encompass benign lesions, CIN 1, and CIN 2. However, a small fraction of cases (4.65%) were undervalued with RCI scores of 0-4. Scores exceeding 5 include CIN 2 or more severe lesions. Notably, none of the lesions in our study were either overestimated or underestimated with RCI scores above 5. Consequently, the accurate diagnosis rate in our study was 95.5%, with only 4.65% of cases being undervalued using RCI. Durdi et al. noted that RCI effectively gauged lesion severity in 85.8% of cases, overestimating in 8.5% and underestimating in 5.5% of cases.[7]

In our research, the sensitivity of the Swede score at a threshold of 4 in diagnosing CIN 2 or more severe lesions was 95%, with a specificity of 100%, a positive predictive value (PPV) of 100%, a negative predictive value (NPV) of 98%, and an overall accuracy of 98%. The sensitivity of the Reid colposcopic index at a threshold of 4 for diagnosing CIN 2 or more severe lesions was determined to be 85%, with a specificity of 100%, a PPV of 100%, an NPV of 93%, and an accuracy of 95%. The correlation between the Swede score and histology was deemed statistically significant ($p < 0.05$), as was the relationship between the RCI and histology ($p < 0.05$). Consequently, both scoring systems demonstrated strong performance, yet the accuracy of the Swede score surpassed that of the Reid Colposcopic Index at the specified threshold of 4 for diagnosing CIN 2 or more severe lesions.

Conclusion

Both scores exhibited satisfactory performance; however, the Swede score demonstrated superior accuracy compared to the Reid Colposcopic Index, particularly at the threshold of 4 for diagnosing CIN 2 or more severe lesions. It was noted that all lesions classified as CIN 2 or worse displayed a Swede score exceeding 5. Based on the aforementioned results, it can be inferred that cases with a Swede score falling within the range

of 0-4 may undergo follow-up without necessitating a biopsy. Conversely, a Swede score exceeding 5 mandates a colposcopic-directed biopsy. The correlation between the size of the lesion and histology indicating CIN2+ was deemed statistically significant ($p < 0.05$).

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