1 CLINICAL ARTICLE

Q1 # Performance of the abbreviated Reid colposcopic index in prediction of high-grade lesions

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ABSTRACT

Objective: To assess the diagnostic performance of the Reid colposcopic index (RCI) and establish the optimal cutoff value to predict a histology of cervical intraepithelial neoplasia grade 2 or worse (CIN2+). *Methods:* A retrospective analysis was undertaken of the medical records of women who underwent colposcopy with RCI scoring at a center in Bangkok, Thailand, between 2003 and 2014. Only patients for whom histology reports were available were included. Cases had been scored according to three criteria: margin, color, and vascular pattern. The performance of this three-criterion score (abbreviated RCI) was assessed for sensitivity, specificity, and positive and negative predictive values at every cutoff level. Receiver operation characteristics (ROC) curve analysis was performed to determine the optimal cutoff value to distinguish between women with CIN2+ and others. *Results:* Among 349 included patients, 158 (45.3%) had CIN2+. The most appropriate cutoff score was 3, which had a sensitivity of 72.7%, a specificity of 86.9%, and positive and negative predictive values of 82.1% and 79.4%, respectively. The area under ROC curve was 0.857 (95% confidence interval 0.815–0.898). *Conclusion:* The performance of the abbreviated RCI seems satisfactory. The optimal cutoff value was 3.

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1. Introduction

Colposcopy is an approved method for the diagnosis of cervical intraepithelial neoplasia (CIN). Clinical management of CIN is based on colposcopic findings and histology from colposcopically-directed biopsy (CDB) specimens [1]. However, understanding colposcopy results is difficult because of the lack of a constant correlation between the visual changes of the cervical epithelium and the severity of the pre-invasive or invasive neoplasia. Prominent areas of colposcopic alterations do not necessarily correspond with those with the most severe histology [2]. Methods for the grading of colposcopic findings, using an aggregate of colposcopic features as opposed to one sign, have been developed to predict the severity of cervical histology through the discriminatory analysis of these features [2].

Reid and Scalzi [2] introduced the Reid colposcopic index (RCI), which takes into account four colposcopic features of premalignant cervical lesions to achieve predictive accuracy: the lesion margin, acetowhitening color, vascular pattern type, and iodine staining reaction [2]. The RCI can predict the histological grade of CIN, differentiating between low- and high-grade lesions [2]. Previous studies have reported a high accuracy and correlation for RCI [2–5]; however, the accuracy and correlation of colposcopy are being increasingly questioned [6–9],

with recent research suggesting that current colposcopic practice based on RCI alone is not satisfactory [6,9].

An understanding of diagnostic tests is essential in attempts to understand the complexity of the colposcopic scoring system. The specificity and sensitivity of any diagnostic test depend on the chosen cutoff values. In the original work of Reid and Scalzi [2], a preliminary subtotal (first three criteria) score of 3 or above (≥3/6) was considered to be a colposcopically high-grade lesion (CIN grade 2/3). However, further studies have used the RCI in modified form. For example, the Coppleson RCI defined a preliminary subtotal score of 4 or above (≥4/6) as the cutoff value to define a colposcopically high-grade lesion [9–11]. Therefore, differences in cutoff values can result in variable outcomes, leading to conflicting data. The aim of the present study was to assess the diagnostic performance of the RCI in the prediction of high-grade lesions and to establish an optimal cutoff value for this scoring system.

2. Materials and methods

A retrospective analysis was undertaken of the medical records of women who had undergone a colposcopy performed by the author from January 2003 to December 2014 at Rajavithi Hospital, Bangkok, Thailand. At Rajavithi Hospital, all women for whom cytologic abnormalities were identified as part of cervical screening—i.e. atypical squamous cells of undetermined significance (ASC-US) or worse—are referred for a colposcopy. Colposcopic findings are documented and specimens are retrieved via CDB from the worst affected area of the cervix and histologically assessed using 3% acetic acid. All women who had

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undergone colposcopy with RCI scoring and with histology reports from CDB specimens retrieved from the scored area were included in the study. When large lesions had been encountered and multiple biopsy samples had been obtained from the same cervix, only the histology from the site where the colposcopic score was highest was selected for inclusion. Women with a normal transformation zone, without a lesion, who were pregnant, who were managed using a see-and-treat strategy, with a history of pelvic radiotherapy, or whose histology results from CDB were not available were all excluded from the study. The research protocol was approved by the relevant institutional review board and ethics committee. Because the study was retrospective in nature and all the data were de-identified, consent was not obtained.

The four-feature RCI has a full score of 8 [2,5,10–12]. In the present study sample, however, the iodine staining score was omitted; the maximum score possible on this "abbreviated RCI" index was 6. All cases were scored 0, 1, or 2 points for each of three colposcopic criteria: the lesion margin (M), acetowhitening color (C), and the vascular pattern type (V). Lugol iodine staining was not routinely applied and only some women were scored using this criterion. For the purpose of analysis, CDB specimens were categorized into two histology groups: CIN1 or less and CIN2 or worse (CIN2+).

The performance of this scoring system was assessed for sensitivity, specificity, positive predictive value, and negative predictive value at every cutoff value. Receiver operation characteristic (ROC) curve analysis was performed to determine the optimal cutoff value to differentiate between women with CIN2+ and those with CIN1 or less. The performance of the scores was also evaluated using the area under the ROC curve. The data were analyzed using SPSS version 11.5 (SPSS Inc, Chicago, IL, USA). $P<0.05$ was considered statistically significant.

3. Results

The records of 349 women were eligible for inclusion. All women were of Asian ethnic origin, and 306 (87.7%) were younger than 50 years. Table 1 shows their demographic and clinical characteristics.

During colposcopy, visibility of the squamocolumnar junction was noted in more than half the women (Table 1). Most colposcopic scoring was recorded using the abbreviated RCI; iodine staining was performed in only 75 (21.5%) cases. Large lesions (3–4 quadrants) were noted in 97 (27.8%) women. Of the 349 CDB histology samples, 191 (54.7%) women had CIN1 or less, and 158 (45.3%) had CIN2+. One case of microinvasive and two cases of invasive cancer were diagnosed from CDB. Endocervical curettage was performed in 22 (6.3%) patients and the results were negative in 18 cases.

The specificity and sensitivity of the abbreviated RCI depends on the chosen cutoff value: with increased cutoff values, the sensitivity decreased, whereas the specificity increased (Table 2). Therefore, using the cutoff value of 4 or above to predict a high-grade lesion had lower sensitivity and higher specificity than did the cutoff value of 3 or above. At a cutoff of a score of 3 or above, there was a significant association between abbreviated RCI and histology of CIN2+ (odds ratio [OR] 17.7, 95% confidence interval [CI] 10.2–30.6). A cutoff value of 4 or above also showed a significant association with CIN2+ histology (OR 17.8, 95% CI 9.7–32.6).

Table 3 demonstrates the individual performance of the three colposcopic criteria at a various cutoff values, and Table 4 shows the univariate and multivariate analysis of each individual criterion for CIN2+ histology. Logistic regression revealed that women with M=2 were at a higher risk of having a histologically-proven CIN2+ lesion than were those with M=0 (P<0.001) (Table 4). Regarding color, women with C=2 were at greater risk of a histologically-proven CIN2+ lesion than were those with C=0 (P<0.001), as were those with C=1 (P=0.001) (Table 4). With regard to vascular pattern, V=2 was associated with an increased risk of a histologically-proven CIN2+ lesion when compared with V=0 (P=0.002). Among the three criteria of RCI, color seemed to be valuable because there was a significant

association between either C=1 or C=2 and a histologically-proven CIN2+ lesion (Table 4).

Fig. 1 demonstrates the ROC curve for the abbreviated RCI, showing that the best cutoff value was 3/6. The area under the ROC curve suggested a very good diagnostic test.

4. Discussion

The present study demonstrates that the best cutoff value in the abbreviated RCI for the prediction of CIN2+ histology is 3, with a sensitivity of 72.7%, a specificity of 86.9%, and maximum accuracy of 80.5%.

Table 1
Demographic and colposcopy data (n=349).

Variable	Value [a]
Age, y	36.7 ± 10.9 (15–85)
Ethnic origin	
Thai	345 (98.9)
Burmese	3 (0.9)
Other Asian	1 (0.3)
Province	
Bangkok	179 (51.3)
Other	170 (48.7)
Smoking	
Current	17 (4.9)
Ex-smoker	17 (4.9)
Never	177 (50.7)
Unknown	138 (39.5)
Parity	
0	83 (23.8)
1	105 (30.1)
2	90 (25.8)
≥3	71 (20.3)
HIV positive	30 (8.6)
Referral cytology	
Negative for intraepithelial lesion/malignancy	1 (0.3)
ASC-US	59 (16.9)
LSIL	125 (35.8)
ASC-H	27 (7.7)
HSIL	114 (32.7)
AGC-NOS	2 (0.6)
AGC-FN	1 (0.3)
Squamous cell carcinoma/adenocarcinoma	16 (4.6)
N/A	4 (1.1)
Cytology-colposcopy interval, d	75 ± 58
Colposcopy	
Squamocolumnar junction visibility	
Visible (completely, partly)	193 (55.3)
Not visible	154 (44.1)
Unknown	2 (0.6)
Number of cervical quadrants the lesion covers	
1	150 (43.0)
2	102 (29.2)
3	47 (13.5)
4	50 (14.3)
Upper border of endocervical part of the lesion cannot be observed	104 (29.8)
Colposcopy impression	
Normal	7 (2.0)
LSIL (HPV/CIN1)	199 (57.0)
HSIL (CIN2/3)	136 (39.0)
Microinvasive/invasive	7 (2.0)
Colposcopically-directed biopsy	
Negative	44 (12.6)
HPV/CIN1	147 (42.1)
CIN2/3	155 (44.4)
Microinvasive	1 (0.3)
Invasive	2 (0.6)

Abbreviations: ASC-US, atypical squamous cells of undetermined significance; LSIL, low-grade squamous intraepithelial lesion; ASC-H, atypical squamous cells and cannot exclude high-grade squamous intraepithelial lesion; HSIL, high-grade squamous intraepithelial lesion; AGC-NOS, atypical glandular cells but not otherwise specified; AGC-FN, atypical glandular cells favoring neoplasia; N/A, not available; CIN1, cervical intraepithelial neoplasia grade 1; CIN2/3, cervical intraepithelial neoplasia grade 2/3.

[a] Values are given as mean ± SD (range), number (percentage), or mean ± SD.