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ORIGINAL ARTICLE

Miniconization procedure with C-LETZ conization electrode for treatment of cervical intraepithelial neoplasia: A Swedish study

MIRIAM MINTS, VERA GABERI & SONIA ANDERSSON

Institute for Clinical Science, Division of Obstetrics and Gynaecology, Karolinska University Hospital, Huddinge, Karolinska Institute, 141 86 Stockholm, Sweden

Abstract

Background. Since 1989 large loop excision of the transformation zone (LLETZ) has become the treatment of choice for cervical intraepithelial neoplasia in many colposcopy clinics. This method has limitations however, in that the resection margins of the cone produced by LLETZ cannot give conclusive histological reassurance, because of thermal injury in 5–30% of the specimens. Furthermore, LLETZ are often taken in several sections, which makes the histopathological examination unnecessarily difficult. As a new and single treatment without these limitations, conization with the contoured loop excision of the transformation zone (C-LETZ) electrode was investigated in the present study. *Material and methods.* One hundred and seventy-four patients with CIN were treated with the C-LETZ electrode during 12 months at the Gynaecological Department, Karolinska University Hospital, Huddinge. The inclusion criteria were a histological diagnosis of CIN II–III, or persistent CIN I. *Results.* Eighty-six per cent of the patients had a complete excision according to histological findings, and 12% had an incomplete excision. The frequency of incomplete excisions increased with the severity of the CIN but were found in all groups of patients: 1 (3%) in CIN I, 5 (12%) in CIN II, and 12 (17%) in CIN III. The resection margins and histological diagnoses were certain in 98% of the cases. A cure rate of 90% was observed. *Conclusions.* Miniconization with the C-LETZ electrode makes it possible to individualize the size of the minicones and produce the minicones as one-piece specimens for histopathological assessment. Our findings confirm that this method is a reproducible, safe, and economical way to treat CIN with a low rate of morbidity in a hospital outpatient setting.

Key words: *CIN, LLETZ, C-LETZ electrode, miniconization*

Abbreviations: *CIN: cervical intraepithelial neoplasia, LLETZ: large loop excision of the transformation zone, Pap smear: Papanicolaou smear, HPV: human papillomavirus, IC: invasive cancer, ESU: electrosurgical unit, C-LETZ: contoured loop excision of the transformation zone*

Introduction

During the last decade, several factors, including the rising incidence of infections of the lower female genital tract and improvements in screening programs, resulted in an increasing number of cervical smears and biopsies with cervical intraepithelial neoplasia (CIN). This increase is found predominately among women of reproductive age (1).

CIN is a premalignant condition that requires appropriate treatment and regular follow-up to detect and prevent any progression of disease. CIN can be managed by ablative (cryotherapy, electrocautery diathermy, or laser ablation) or excisional (cold-knife, CO_2 laser, or LLETZ) procedures. However, the ablative procedures do not provide any tissue specimen for histological confirmation, the use of traditional cold-knife conization usually requires general anesthesia, and laser conization involves special training and high capital cost (2).

Since 1989 LLETZ has become the treatment of choice in many colposcopy clinics around the world (3–9) and this method produces tissue specimens for histopathology, thus minimizing the risk of over-

Correspondence: Sonia Andersson, Institute for Clinical Science, Division of Obstetrics and Gynaecology, Karolinska University Hospital, Huddinge, Karolinska Institute, 141 86 Stockholm, Sweden. E-mail: sonia.andersson@telia.com

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looking IC. However, the excision margins of the cone produced by LLETZ cannot give conclusive histological reassurance, as most standard procedures cause thermal injury in 5–30% of the resection margins of the specimens (10). Furthermore, loop excisions are often taken in several sections, which makes the histopathological examination unnecessarily difficult (6).

As a single treatment, miniconization with the contoured C-LETZ electrode (Utah Medical Products, Inc.) was investigated in the present study.

We have been the first department in Sweden to use the C-LETZ electrode for miniconization.

Patients and techniques

One hundred and seventy-four patients with CIN were treated with the C-LETZ electrode during a 12-month period at the Gynaecological Department at the Karolinska University Hospital, Huddinge.

An electrically isolated bi-valve speculum with a port for smoke evacuation was used. All patients were examined colposcopically before the C-LETZ procedure. All patients were given paracetamol 1 g (Alvedon, AstraZeneca) and diclofenac natrium 50 mg (Diklofenak, NM Pharma) 30 min prior to surgery. As a rule, C-LETZ miniconization was done under local anesthesia with 10–20 ml 1:200,000 adrenaline with mepivacaine hydrochloride 5 mg/ml (Carbocain, AstraZeneca) being infiltrated at 2, 5, 7, and 11 o'clock positions of the cervix peripheral to the lesion about 5 mm deep into the cervical parenchyma. During the surgery, all patients, regardless of the severity of pain, were given alfentanil hydrochloride (Rapifen, Janssen-Cilag) 0.5 mg/ml 0.5–1.0 ml i.v. and midazolam (Midazolan, Alpharma) 1 mg/ml 1–2 ml i.v. for sedation. A Finesse (450 kHz) electrosurgical unit (ESU) produced by Utah Medical Products, Inc., USA was used as the source of electrical energy. The generator was generally set to deliver 60 W for the cut mode and 60 W for the coagulation mode. The blended cut waveform 1 or 2 was used. The vaginal speculum's built-in smoke evacuation port was connected to the Finesse's integrated smoke evacuation/filtration system. The C-LETZ electrodes have a patented, contoured shape and are available in four models (radius × depth: 15 × 23 mm, blue; 11 × 18 mm, green; 12 × 10 mm, tan; and 9 × 13 mm, yellow). The contoured shape is asymmetric and appropriate for conization of lesions with different degrees of ectocervical and endocervical extensions (Figure 1). The appropriate C-LETZ model was selected according to the extension of the lesion as determined by biopsy and colposcopy, the age of the women, and parity. The conization was performed according to the following four-step sequence: 1. the electrode tip was placed at the cervical os, with the electrode arm in the 12 o'clock position; 2. the ESU was activated and the C-LETZ plunged perpendicularly into the cervical tissue to its maximum depth (10–23 mm, depending on the C-LETZ electrode selected); 3. the C-LETZ electrode was swiftly rotated 360° around the transformation zone; 4. the excision and the electrode with the minicone specimen was removed.

Each excised minicone specimen removed from the C-LETZ electrode was a constant thickness, one-piece specimen. Hemostasis after surgery was, if needed, achieved by electrocoagulation (fulguration)

Figure 1. The C-LETZ electrodes are available in four models (radius × depth: 15 × 23 mm, blue; 11 × 18 mm, green; 12 × 10 mm, tan; and 9 × 13 mm, yellow).

employing the ball electrodes supplied by Utah Medical Products Inc.

Results

Colposcopic-guided biopsy prior to the operation revealed persistent CIN I in 22%, CIN II in 31%, CIN III in 45%, and unsatisfactory biopsy specimens in 2% of cases (Table I). In total, 174 women underwent conization with the C-LETZ electrodes. The results are summarized in Table II.

After the operation no pathology was found in 19 specimens possibly due to the fact that the lesion had been removed together with the biopsy tissue or due to the unclear pathological diagnosis from the beginning. Among those 19 women, 4 had CIN I, 11 CIN II, and 4 CIN III according to the previous diagnosis from colposcopically directed cervical biopsy. The histological examination of the 174 excised cones showed pathological changes in 155 cases: 19.5% were CIN I, 25% CIN II, and 41% CIN III lesions. Adenocarcinoma *in situ* was found in three cases; microinvasive cervical cancer was found in two cases; and invasive squamous cervical carcinomas in one case (Table II). The excised tissue specimen from all three patients with unsatisfactory specimens from the biopsy prior to the operation demonstrated preinvasive lesions in the excised tissue cone. In 75% of the patients there was full correlation between the histological diagnosis from the colposcopically directed cervical biopsy and the excised tissue cone.

Eighty-six per cent of the patients had a complete excision according to the histological findings, 12% had an incomplete excision, and in only 2% of the cases the diagnosis was not clarified due to uncertain resection margins (char/thermal artifact). The frequency of a complete excision decreased with more severe CIN disease (91% in CIN I, 88% in CIN II, and 82% in CIN III). Two of the three samples with uncertain margins were allocated to the group with persistent CIN I whereas the last sample came from the CIN III group.

Results of morbidity associated with C-LETZ miniconization are summarized in Table III. The estimated blood loss in the patients operated with the C-LETZ miniconization varied from 15 to 40 ml (median 15 ml). None of the patients who underwent office-based miniconization with the C-LETZ electrode were hospitalized. The average length of the hospital stay for all 174 patients was two hours.

Seventeen patients were admitted postoperatively as emergencies. Four of the patients were admitted within 24 h after the operation because of primary hemorrhage and were initially examined in the emergency room. Two of them were treated in the operating theatre under general anesthesia and underwent suturing of the cervix. The other two patients were treated in the emergency room under local anesthesia by electrocoagulation/fulguration with ball electrodes. Eleven of the patients were admitted for secondary hemorrhage at a time interval of 2–24 days postoperatively. They were treated with Monsel's solution. We found that the use of the large DCE-110 C-LETZ electrode (radius × depth: 15 × 23 mm) seemed to correlate to the instances of hemorrhage as well as to the occurrence of stenosis. The future use of this electrode has therefore been limited to cases where there is a clear need for a large resection capability of the electrode.

After a six-month follow-up period we found that six patients in our series had cervical stenosis, which was discovered at the time of the first examination. The mean age of those patients was 57.6 years.

A cure rate of 90% in the first six months was observed. Among the 21 patients with no clear resection margins we have the six-month follow-up data for 13 patients. Eight of these patients showed no dysplasia whereas five of the patients had dysplasia.

Table I. Results of preoperative colposcopic-guided histopathology in 174 patients.

	CIN I	CIN II	CIN III	Unsatisfactory biopsy specimens	Total
Histopathology	38	54	79	3	174
%	22	31	45	2	

Cost/benefit

Substantial savings may be obtained when the conizations are performed in an outpatient environment according to our protocol, compared with cold-knife or laser conization in a strict operation environment. We calculate that savings in costs for the operation room, anesthesiologist, medication, sterile equipment, operating personnel, and patient stay may amount to more than USD 1000 per operation, i.e. around USD 7.5 million per year if all Swedish conizations were performed according to our protocol.

Discussion

Several studies have reviewed the usefulness of LLETZ in the treatment of CIN (5,11–14). When compared with either cold knife conization (15) or

Table II. Results of histopathology of the C-LETZ electrode specimens in 174 patients.

Result	Resection margins clear, no. (%)	Resection margins not clear, no. (%)	Resection margins uncert., no. (%)	Total
Histopathology				
Negative	19			19
CIN I	31 (91)	1 (3)	2 (6)	34 (19.5)
CIN II	38 (88)	5 (12)	–	43 (25)
CIN III	59 (82)	12 (17)	1 (1)	72 (41)
Adca in situ	1	1	1	3
Microinvasive squamous carcinoma	1	1		2
Invasive adca		1		1
Totally	149 (85.7)	21 (12)	4 (2.3)	174

carbon dioxide laser treatment (16,17) this procedure has been found to produce similar cure rates with fewer complications or morbidity.

In our study, miniconization with the C-LETZ electrode was performed by removing 2–5 mm of tissue around the lesion. Identification of the specimen margins was easy, and pathological evaluation of the specimens was performed as readily. The bands of the electrocoagulation artifacts at the ectocervical and endocervical margins were narrow, distorting only a small percentage of the epithelial surface area. The pathologist was able to determine a final diagnosis of the majority (98%) of the minicone specimens.

Chan et al. (6) reported that the incidence of involvement of contact coagulation at the resection margins of the LLETZ specimens was 25%. Others have reported rates of 5.3–27% of cases (18–21).

In our series with C-LETZ electrode miniconization we found complete excision of the lesion and clear resection margins in 86% of the cases. The electrode cutting wire is made of tungsten which has superior energy transfer and the wire diameter is only 0.3 mm. Futhermore, the ESU we used is equipped with a microprocessor which ensures that the voltage at the cutting wire is constant, thus avoiding voltage peaks which may cause unwanted contact coagulation at the incision. These factors may explain why it is possible to excise cones with a minimum of contact coagulation, and thus ensuring more correct pathological diagnosis of the cones.

Table III. Morbidity associated with the C-LETZ electrode of the transformation zone.

Types of morbidity	No. of patients	%
Intraoperative hemorrhage	0	
Emergency admissions:		
Primary hemorrhage	4	2.3
Infection	2	1.2
Secondary hemorrhage	11	6.3
Cervical stenosis*	6	3.4

*Discovered 6 months after the conization.

The pathological report of incomplete excision or marginal involvement may give rise to concerns of inadequate treatment. The available evidence suggests that only a minority of these cases harbor a residual lesion (12) and the presence of incomplete excisional margins does not adversely affect the long-term outcome in terms of treatment failure (18). Such observations are explained by the fact that the thermal cutting effect and post-LLETZ and -C-LETZ coagulation diathermy to the cervical craters may help destroy small lesions at the surgical margins or on the tissue surface.

Miniconization with the C-LETZ electrode makes it possible to individualize the size of the minicones. This may be the way to decrease the incidence of bleeding, infection, and cervical stenosis. Our specimens were smaller and thus a smaller amount of healthy tissue was excised. It has previously been shown that a margin of 5 mm of normal tissue around the colposcopically defined lesion is optimal (22).

The procedure produces a minicone that is a one-piece specimen for histopathological assessment, which gives a very low frequency of bleeding complications. The incidence of primary hemorrhage within 24 h of the operative procedure in our study is 2.3%, which is the same as the 2% reported in other studies (3,6,8,23). It has been suggested that primary hemorrhage may be related to the amount of cervical tissue excised and, therefore, only the minimum amount of tissue compatible with successful treatment should be excised. Secondary hemorrhage appears to be a more common problem, with reported incidence from 0.6% to about 5.5% (3,24,25). In our study the incidence is 6.4%, which is higher than the other series but approximately the same as described by Chan et al. (6%) (6). However, the cases reported in other series represent those patients who had sufficiently severe bleeding to

require hospitalization with suturing of the bleeding points. The majority of our patients were well and were treated on an outpatient basis. These bleedings were of a minor degree and were managed by treating the cervix with a vasoconstrictive solution in all cases. This assumption is apparently supported by the median blood loss of only 15 ml.

Six patients in our study (3.4%) had cervical stenosis. The incidence of cervical stenosis in other series has been reported to be between 1.3 and 10%, which is much lower than the 17% incidence found with cold knife cone biopsy (24–26). The occurrence of cervical stenosis has been reported to be related to a depth of excision greater than 14 mm. In our study the development of stenosis was correlated to an older age (mean age 57.6 years) among the women. In this category of patients, local estrogen treatment after the operation might be considered in the future as a means to decrease the risk of postoperative stenosis.

The C-LETZ miniconization procedure is non-traumatic and requires only the use of an electrically isolated speculum with a port for smoke evacuation. The method is gentle to the patient and does not require any painful repositioning of the cervix. Therefore the C-LETZ miniconization is generally done under local anesthesia, in contrast to the CO_2 laser miniconization, which has to be done under general anesthesia.

In conclusion, the conization by C-LETZ electrode is a safe, precise, and effective treatment modality for CIN. By the use of this method it was possible to remove an adequate amount of tissue, intra- and postoperative bleeding was diminished, and the success rates were acceptable. We recommend miniconization by C-LETZ electrode for outpatient use on the basis of the acceptability of the tissue effects, its inexpensive technology, and its inherent safety.

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