Cervical Excision Procedure: Loop Electrosurgical Excision Procedure and Cold Knife Cone

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Introduction

Excision is widely used as treatment for high-grade squamous intraepithelial lesions (HSIL) of the uterine cervix (cervical intraepithelial neoplasia [CIN 2 and CIN 3]).* It is preferred over ablation

- of large lesions (>75% of cervix area).
- of lesions extending into the endocervical canal.
- if the transformation zone is not fully visualized.

Loop electrosurgical excision procedure (LEEP) is usually an office procedure performed under local anesthesia.

Cold knife cone (CKC) is performed in the operating room usually with general or regional anesthesia.

*Lower anogenital squamous terminology (LAST) terminology is used in this module.
Introduction

Excision

- provides tissue for histologic examination.
- reduces the risk of missing occult invasive cancer.
- allows for assessment of surgical margins.

- Success rates are high with LEEP and CKC.
- Risk of recurrence is lower with CKC.
- Perinatal risks in subsequent pregnancy are higher with CKC.
Treatment Options

Observation
• Active monitoring of low-grade squamous intraepithelial lesions (LSIL) (CIN 1) using repeat cytology and human papillomavirus (HPV) DNA testing
• Active monitoring of HSIL (CIN 2 and CIN 3) or cytology/histology discrepancy in young women with colposcopy and cytology

Ablation
• Destruction of the entire transformation zone

Excision (LEEP and CKC)
• Removal of the transformation zone provides tissue for histopathology evaluation
Indications for LEEP

• HSIL (CIN 2 and CIN 3) on colposcopic biopsy
  o Observation preferred if HSIL on biopsy and CIN 2 or CIN 2 and 3 specified and fertility desired
• HSIL on cytology
  o Colposcopic confirmation optional if plan to proceed to excision
• LSIL (CIN 1) on biopsy
  o If persists for 2 years, continued observation also is an option
  o If preceded by cytology report of ASC-H, HSIL, or atypical glandular cells (AGC), options include
    ▪ co-testing in 12 months and 24 months
    ▪ review of cytology, histology, and colposcopy
Indications for CKC

The indications are the same as indications for LEEP, plus

• suspected microinvasive squamous carcinoma
• rule out adenocarcinoma in situ
  o Requires deep cylindrical endocervix conization
• distorted cervical or vaginal anatomy
  o Cervix fixed in downward pointing position
  o External os obliterated or flush with vaginal apex
• high-grade lesion extends deep into canal
  o Cone versus LEEP with top hat
General Principles of Treatment

• HSIL (CIN 2 and CIN 3) begins at squamocolumnar junction
  o If colposcopy adequate, squamous lesions do not begin de novo within the endocervical canal
• Most severe area of lesion is usually most central
• Treat the transformation zone 360 degrees
  o Excise circumferentially to a distance at least 2-3 mm beyond width of lesion
  o Higher failure rates if the lesion only is treated
• Excise to depth of at least 5-7 mm
  o 99% of endocervical gland involvement to depth <5 mm
Excision Procedures: Contraindications

**LEEP**
- Severe cervicitis
- Pregnancy
- Allergy to local anesthetic
- Hemorrhagic disorder/anticoagulant therapy
- Demand-type cardiac pacemaker
- Suspected microinvasive or invasive cancer (relative)
  - Risk of thermal artifact
- Suspected adenocarcinoma or adenocarcinoma in situ (relative)
  - Risk of thermal artifact

**CKC**
- Severe cervicitis
- Pregnancy (relative)
- Contraindications to anesthetic
- Hemorrhagic disorder/anticoagulant therapy
Principles of Electrosurgery

• Cutting current
  o High frequency alternating current produces very rapid alteration from positive to negative
    ▪ Rapid fluctuation of ions produces heat
  o Current arcs
    ▪ Steam envelope forms around arcing electrons—helps conduct current
    ▪ Electrode held near tissue but never touching tissue
  o Loop must be moved continuously to maintain steam envelope
    ▪ Stalls if touches tissue
Principles of Electrosurgery

• Coagulation current
  o Short bursts of modulated voltage sine wave current
  o Desiccation: Electrode touches tissue
    ▪ Dehydrates cells, deeper tissue damage than fulguration
    ▪ Use for hemostasis after LEEP or electrosurgical ablation of cervix lesion peripheral to LEEP site
  o Fulguration: Arc sprays above tissue
    ▪ Lower temperature, less cautery artifact
    ▪ Use for hemostasis after LEEP

• Blended current—80% cut: 20% coagulation
  o Commonly used instead of pure cutting current
    ▪ Acceptable level of cautery artifact
    ▪ Better hemostasis than pure cut
System Elements of LEEP

- Monopolar electrosurgical generator (ESU) with isolated circuitry and monitoring system
- Smoke evacuator (may be separate or built in)
- Active tissue electrode (loop and ball electrodes)
- Insulated vaginal sidewall retractor often helpful (not shown)
- Return electrode (dispersive pad)
- Insulated speculum with smoke evacuation port

Image courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
Electrosurgical Circuit

Current flows from generator to active tissue electrode (high-current density) through patient to dispersive pad (low-current density) and back to generator.

Image courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
LEEP Safety Precautions

• Remove metal jewelry from patient
• Avoid grounding to metal equipment
  o Metal stirrups, instrument trays, or intravenous poles
• Dispersive pad (return electrode) must be in complete contact with patient near operative site
• Inspect return electrode and generator for frayed wires
• Avoid alcohol and flammable liquids near electrode
• Patient should not have cardiac pacemaker
• Ask about allergies to anesthetic or iodine
LEEP Technique

- Review Pap test and colposcopy test results
- Obtain informed consent
- Repeat colposcopy to identify lesion
- Apply Lugol solution to outline lesion and area of transformation zone to be removed

Images courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
LEEP Technique: Anesthesia

Submucosal intracervical field block

- 1% or 2% lidocaine with epinephrine or pitressin
  - One approach: 5 cc 2% lidocaine with 1:100,000 dilution epinephrine follow with additional 1% or 2% lidocaine without epinephrine
- Inject at multiple sites with small gauge spinal needle
- Wait several minutes
- Transient tachycardia normal

Image courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
LEEP Technique

• LEEP should be performed through the colposcope for precision
• LEEP will remove 360 degrees of transformation zone to width of 2–3 mm lateral to lesion
• Perform practice pass with current turned off to correlate dimension of excision with size of lesion
• Start blended or cutting current before touching tissue
  o Current setting depends on generator and size of loop
LEEP Technique

- Perform LEEP in a single smooth movement
  - Side to side preferred
  - Convexity of loop through center of cervical canal
- Endocervical top hat extension if indicated
- Shallow excision or ablation with cautery if part of lesion remains peripheral to excision margins
- Endocervical curettage

Image courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
LEEP Technique

- Cauterize base with ball electrode
  - Avoid os to decrease stenosis
- Monsel solution may be needed
- Pin out specimen on wax mould—orient ectocervical versus endocervical margin
The Top Hat

- Second deeper 1 cm x 1 cm endocervical excision after the initial LEEP excision
- Indications
  - Suspected disease in canal above depth of LEEP
- Increased risk of thermal artifact

Images courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
CKC Technique

- General or regional anesthesia in operating room
- Identify transformation zone with colposcopy, Lugol solution, or both
- Anterior lip of cervix stabilized with tenaculum
- Cervix may be injected lateral to the planned incision with dilute vasopressin 0.5 U/mL or epinephrine solution 1:200,000 for hemostasis
- Stay sutures placed near level of internal os at 3:00 and 9:00
  - 2–0 delayed absorbable sutures
  - Hemostatic, useful for traction, may be loosely tied together to hold hemostatic agent at conclusion of case
CKC Technique

• Using straight or angled scalpel with #11 blade, perform cone-shaped excision
  o Remove 360 degrees of transformation zone beginning 2–3 mm lateral to lesion
  o Remove endocervical canal to sufficient depth to remove endocervical disease
• Base excised with curved scissors

Image courtesy of Alan G. Waxman, MD, MPH, Department of Obstetrics and Gynecology, University of New Mexico.
CKC Technique

• Hemostasis
  o Running locking suture (2–0 or 3–0 delayed, absorbable) around excised edge
  o Alternatively, cautery may be used (the same as in LEEP)
  o Accessories for hemostasis
    – Monsel solution
    – Hemostatic agent in cone bed loosely tied in place with stay sutures previously placed at 3:00 and 9:00
LEEP and CKC Discharge Instructions

• Ibuprofen or acetaminophen usually sufficient for pain—expect mild cramping
• Back to work 1-2 days for LEEP, possibly 1-2 days longer for CKC
• Patient will have vaginal discharge for several days to weeks
• Avoid intercourse for 4 weeks
• Avoid heavy lifting or vigorous exercise for 2 weeks
• Return to clinic or call for heavy bleeding, fever, or severe abdominal pain
LEEP and CKC Complications

- **Bleeding**
  - Intraoperative blood loss: Cone > LEEP
  - Delayed bleeding risk comparable between LEEP and cone

- **Stenosis**
  - More likely with deep excision (>2 cm) or totally endocervical lesion

- **Thermal artifact with LEEP**
  - May obscure margins

- **Unintentional burns with LEEP**
  - Vaginal sidewall
  - Under return electrode or alternate ground

- **Uncommon with modern generators**
Obstetric Outcomes after LEEP Versus CKC: Two Meta-analyses

<table>
<thead>
<tr>
<th>LEEP</th>
<th>CKC</th>
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<tbody>
<tr>
<td>Statistically significant increase</td>
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<tr>
<td>• Late preterm births (&gt;32-34 wk)</td>
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<tr>
<td>• Prelabor Preterm Rupture of Membranes (pPROM)</td>
<td>• Preterm births &lt;32-34 wk</td>
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<td>• Low birth weight infants</td>
<td>• Low birth weight infants</td>
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<td>No statistically significant increase:</td>
<td>No statistically significant increased risk of preterm birth after LEEP</td>
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<td>• Cesarean delivery</td>
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<td>• Neonatal intensive care unit (NICU) admissions</td>
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<td>• Perinatal mortality</td>
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There is no statistically significant increased risk of preterm birth after LEEP compared with women with cervical dysplasia but no excision.
Risk of Recurrence After Treatment

- Retrospective study of 37,142 women treated for CIN
  - Compared cryo, laser, cone, and LEEP with negative margins

- Recurrence of CIN 2,3 in first 6 years after treatment
  - Higher with older age
  - Higher with more severe diagnosis at treatment
    - CIN 3 > CIN 2 > CIN 1
  - Varies with treatment modality
    - Cryo > Laser > LEEP > Cone
  - Rate of CIN 2,3 diagnosis after treatment of CIN 3
    - Age 30–39 years: CKC 6.3% LEEP 9.6%
    - Age 40–49 years: CKC 8.5% LEEP 12.9%
Risk of Recurrence if Margins Involved

• Meta-analysis of 25 studies
  o Risk of recurrence of CIN 2+ after incomplete excision 6.09 (3.87–9.60) compared with complete excision
  o Frequency of post treatment CIN 2+
    ▪ Clear margins—3%
    ▪ Margins involved—18%
ASCCP Guidelines for Follow-up After Treatment of CIN 2 and CIN 3

- Cotesting at 12 months and 24 months
  - Results negative for cytology and HPV x 2 → cotesting in 3 years—if results are negative, return to routine screening
  - If any test positive → colposcopy with endocervical sampling
- CIN 2+ identified at surgical margins or on immediate post procedure endocervical curettage:
  - Repeat cytology and ECC in 4–6 months (preferred)
  - Repeat excision (acceptable)
  - Hysterectomy acceptable if repeated excision is not feasible

Abbreviations: ASCCP, American Society for Colposcopy and Cervical Pathology; ECC, endocervical curettage.
References

Bibliography


