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RESEARCH ARTICLE

EFFECT OF USING DIODE LASER VAPORIZATION IN TREATING SELECTED CASES OF CERVICAL INTRAEPITHELIAL NEOPLASIA II

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ABSTRACT

The objective of this study was to prove the beneficial effect of using the diode laser vaporization in treating selected cases of CIN II. Fifteen women with CIN II were analyzed; two of them have been undergone total abdominal hysterectomy without salpingo oopherectomy, eight of them have been treated with electrocautery diathermy and five with diode laser vaporization and then to be followed up after six weeks and then every five months. Among the women treated with diode laser; four women had negative results after six weeks follow up with Pap smear and one showed recurrence. The data demonstrates the beneficial effect of diode laser vaporization in treating CIN II with minimal complications.

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INTRODUCTION

The laser has provided a relatively easy and safe method for treating all types of CIN. The advantages of lasers include great conservatism due to tissue sparing, great precision because of microsurgical method, combination of excisions and vaporization possible, suitable for therapy of multifocal disease and good hemostasis. Although other modalities have also been used successfully in the therapy of this disease, it appears that none are so versatile as CO2 laser or possess its ability to accurately treat the multifocal disease that may involve large surface areas of the lower reproductive tract. It seems unlikely that any of the cervical ablation methods--chemical destruction, hot cautery, diathermy electrode, cryoprobe, laser, and diathermy loop--will completely disappear from use in the near future. Ablation is an attractive alternative to cold-knife excision in properly triaged patients, since it is almost always an outpatient procedure done without anesthesia or with only local anesthesia. Most importantly, a large number of patients have completely visible lesions of a severity less than that of in situ cancer; they really do not need excisional conization by any technique and benefit by quick ablation of the transformation zone. A conization, to be diagnostic and therapeutic, must remove the entire transformation zone to the proper depth. This procedure is almost always attended by a higher morbidity rate than is simple ablation.

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Laser excisional conization and the large loop excision of the transformation zone procedure are similar in a number of respects, because the operator must have certain capabilities and a through understanding of the disease to be treated to perform the operation correctly.

Ectocervix: The portion projecting into the vagina is referred to as the portio vaginalis or ectocervix. On average, the ectocervix is 3 cm long and 2.5 cm wide. It has a convex, elliptical surface and is divided into anterior and posterior lips. **External Os:** The ectocervix's opening is called the external os. The size and shape of the external os and the ectocervix varies widely with age, hormonal state, and whether the woman has had a vaginal birth. In women who have not had a vaginal birth the external os appears as a small, circular opening. In women who have had a vaginal birth, the ectocervix appears bulkier and the external os appears wider, more slit-like and gaping. **Endocervical canal :-**The passageway between the external os and the uterine cavity is referred to as the endocervical canal. It varies widely in length and width, along with the cervix overall. Flattened anterior to posterior, the endocervical canal measures 7 to 8 mm at its widest in reproductive-aged women.

Internal Os :-The endocervical canal terminates at the internal os which is the opening of the cervix inside the uterine cavity.

Cervical crypts :-There are pockets in the lining of the cervix known as cervical crvpts. They function to produce cervical

fluid. (Weschler, Toni, MPH, Taking Charge of Your Fertility. Second Edition, 2002, pg.59, 64).

Squamocolumnar Junction :-The SCJ is the fine along which the stratified squamous epithelium meats the columnar epithelium of the endocervix. The original SCJ is where the squamous cells of the ectocervix meats the columnar epithelium of the endocervix, the union between these two epithelia is sharp. The new or functional SCJ is established between the newly formed squamous cells of the SCJ and the columnar cells of the endocervix.

Transformation Zone:- It represents the area of the epithelium between the original and the new SCJ. The epithelium of the cervix is nonkeratinized stratified squamous epithelium at the ectocervix, and simple columnar epithelium at the cervix proper Nabothian cysts are often found in the cervix. (Histology at BU 19404loa) Histology at USC rep/c_48.

Cervical intraepithelial neoplasia, or **CIN**, is the abnormal growth of precancerous cells in the cervix. Most cases of CIN stay the same or are eliminated by the host's immune system without intervention, but a small percentage of cases progress to become cervical cancer, usually cervical squamous cell carcinoma, or SCC. (Weschler, Toni, MPH, Taking Charge of Your Fertility. Second Edition, 2002, pg.59, 64)**.** The major cause of CIN is infection with the sexually transmitted human .papillomavirus (HPV), usually the high-risk HPV type 16.

Grades :-CIN has four distinct grades: CIN 1 (Grade I), the least risky type, represents only mild dysplasia, or abnormal cell growth. . (Weschler, Toni, MPH, Taking Charge of Your Fertility. Second Edition, 2002, pg.59, 64) And is considered a low grade squamous intraepithelial lesion (LGSIL). . (Histology at BU 19404loa) CIN 2 (Grade II) as well as the two higher grades are considered high grade squamous intraepithelial lesions (HSIL); (Histology at BU 19404loa) CIN 2 represents moderate dysplasia, CIN 3 (Grade III): Severe dysplasia, carcinoma in situ. CIN 4 (Grade IV): Invasive carcinoma. Cases of CIN are thought by some to progress through these stages toward cancer in a linear fashion (Hillemanns P, Wang X, Staehle S, Michels W, Dannecker C, 2002). However, evidence suggests that cancer can occur without first detectably progressing through these stages and that a high grade intraepithelial neoplasia can occur without first existing as a lower grade. (Agorastos T, Miliars D, Lamnropoulos A, Chrisafi S, Manthos A, Bontis J (2005).

Epidemiology of CIN: Many evidences suggest an association of the disease with the sexual behavior, parity & the age of the first intercourse (Terris et al.1967.Rotkin 1973). The number of the sexual partner found to be another associated factor (harries et al 1980) HPV has been established as an essential cause of CIN&carcinoma of the cervix. HPV is a double stranded DNA virus. There are more than 100 type of HPV, among them 15 are oncogenic. It is present in about 90% of cases of CIN and cervical carcinoma. The types 16, 18, 31&45 has the strongest association with CIN. Most of the cases of HPV will clear spontaneously few will persist to progress to precancerous lesion & then invasion. HPV type 16 is the major type present in about 50% of cervical carcinoma while type 18 in about 20% of cases (Mounz N-Bousch FX,deSanjose S etal). Other additional risk factor include the simultaneous infection with different types of HPV ,the virus load, duration of HPV infection and the individual genetic predisposition to malignancy (Kataja et al 1993). Other factor also include the dietary factor (vitamin a, c and folic acid deficiency), cigarette smoking, contraception and steroid drug abuse (Montero V. bosch, FX.Mounz N et al). Other sexually transmitted diseases including HSV II, Chlamydia, Syphilis or Tricomonas virginals and HIV also play a role in predisposition to CIN (Smith JS.Munoz N.Herrero R.et al).

Conventional Treatment of CIN:-The treatment of CIN including the carcinoma insitu depends on the site and extent of the abnormal cell changes. - CIN I lesion often regresses and simply requires careful follow up with colposcope and Pap smear - Women with CIN II and CIN III have high risk to progress to cancer if not removed. Therefor finding CIN II and CIN III is an indication for removal of the entire extent of the suspicious tissue.

Loop Electrical Excision Procedure:- This uses a high frequency electrical current for cutting away the diseased tissue.

- Local anesthesia is supplied to the cervix and wire loop is inserted into the vagina.
- A button sized slice of tissue is removed from the cervix.
- Deeper slice is removed to evaluate the endocervical canal.

The procedure requires only one visit. Extensive and deep sections of the damaged tissue can be effectively removed and very high cure rate is possible with only one visit. Some expert feels that the only drow back of LEEP is its simplicity that is the physician may use it for more serious conditions best treated by conization, it may also impairs the ability to detect hidden invasive cancer.

Cryosurgery :-This is not usually feasible for large extensive abnormal area. The procedure removes abnormal but noncancerous tissue by freezing it. Cryosurgery can be performed in an outpatient in 15 minute, with nut medication.

- The vagina is opened with speculum and a probe transmit gas, either CO2 or N2O, which freeze the surface of the cervix.
- The gas is applied for three minutes or until ice crystals form on the targeted tissue.
- After waiting three minutes, freezing can he repeated for another three minutes. Side effects from this procedure include cramping, some times painful, for few hours or days & a heavy, watery discharge for 2 to 4 weeks. The discharge may be irritating, have a bad odor, and blood tinged. Symtoms may indicate serious complications are fever and chills, heavy clotted bleeding, or extreme pain in the abdomen or the back. The patient may also experience a temporary change in the menstrual period.

Cold Coagulation:- This was used first in 1966 to treat cervicitis by an instrument that would allow tissue destruction by thermal heating to the range of 50°C to 120°C. Energy is delivered to the tissue via a Teflon probe called a cold coagulator. The procedure is simple and pain Free & can destruct the tissue up to the depth of 2.6-3.5mm which corresponds to that of cryocautery.

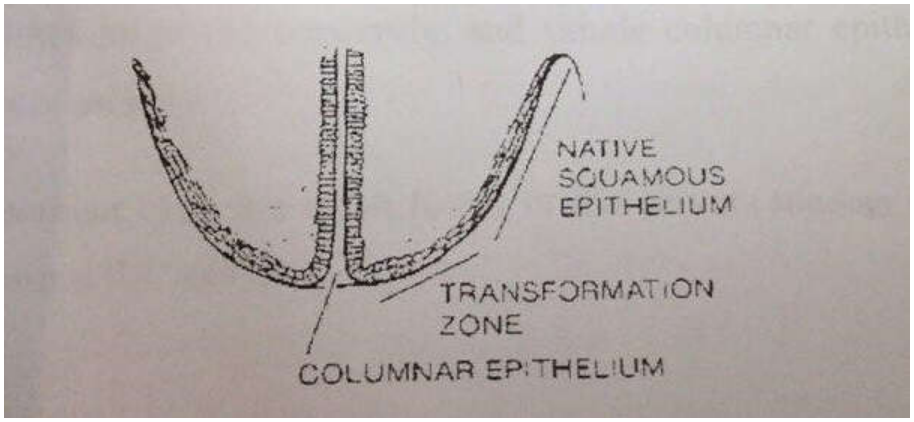

Figure 1-1. Cervical anatomy (Wright VC etal)

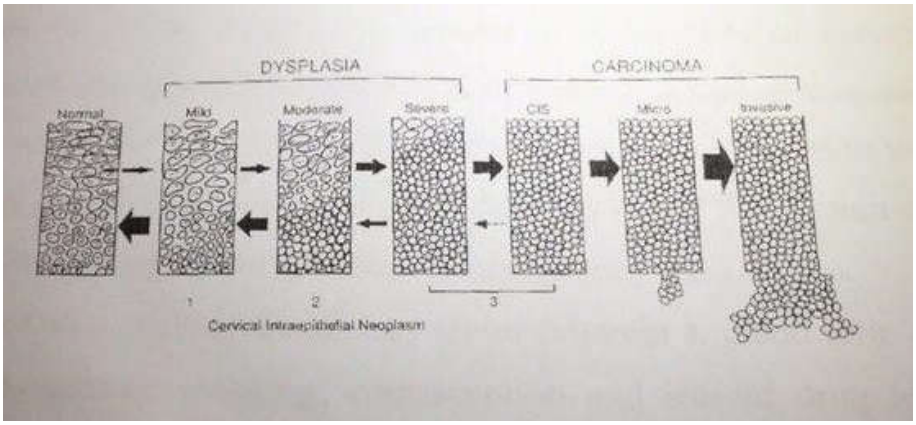

Figure 2-1. Grades of CIN (Weschler, Toni 2002)

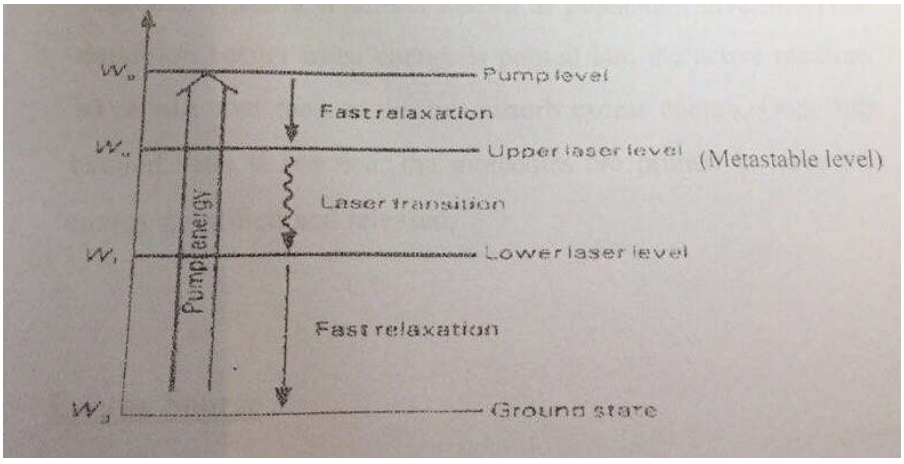

Figure 1-3. Diagram showing the laser generation mechanism (Neims.M.H, 1996)

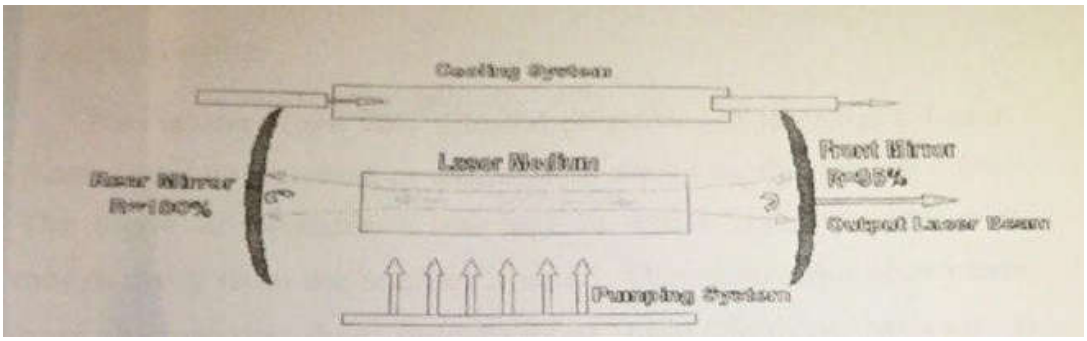

Figure 1-4. Component of laser system (Neims. M.H, 1996)

Eleetrocoagulation Diathermy:- By this method the diseased tissue is destroyed by the heat delivered through a needle & a ball electrode placed in the substance of the cervix, this can the tissue until the depth of 10 mm This is considered as a successful method in the treatment of the CIN. The problem with this method is cervical stenosis, infection & future infertility, which is rare. This procedure needs regional or general anesthesia making the procedure more dangerous and expensive than cryosurgery.

Cone Biopsy :- By this procedure a cone shaped piece of tissue is removed by the use of laser or a surgical instrument. This method is considered as diagnostic & therapeutic at the same time with a high success rate for CIN & carcinoma insitu. This procedure needs general anesthesia & may lead to many complications like heavy bleeding during the procedure, interference with the child bearing & future infertility.

Hysterectomy :- This is used for high grade CIN & carcinoma insitu for women who complete their family. This is a major surgical procedure but has the lowest recurrence rate.

All-Trans-Retinoic Acid:- A molecular relative of vitamin A, known as all- trans-retinoic acid, was shown in one study to reverse mild cases of cervical dysplasia in nearly half the women who used it. For advance cases, however, it has had no effect, even in adding benefits with . Other cancer agents. It is still an investigational treatment for early stages.

LASER BASIC :- Light Amplification by the Stimulated Emission of Radiation was originally described as a theoretical concept by Albert Einstein in 1917, but it was not until 1954 that the first "stimulated" emissions of microwave radiation (MASER) were generated by J.P. Gordon and C.H. Townies at Bell Laboratories. Theoretical calculations for the construction of a visible light MASER, or LASER were published in 1958. The first LASER was built in 1960 by Dr. T.H. Maiman at Hughes Aircraft Company, using a synthetic ruby rod stimulated by high intensity flash lamps, which generated millisecond pulses of coherent 694nm Ruby Laser (red) light . Shortly afterwards, 1060nm (near-infrared) laser light was generated by stimulating glass rods doped with Neodymium (ND: Glass Laser). Within a year, pioneers such as Dr. Leon Goldman began research on the interaction of laser light on biologic systems, including, early clinical studies on humans. Interest in medical applications was intense, but the difficulty controlling the power output and delivery of laser energy, and the relatively poor absorption of these red and infrared wavelengths led to inconsistent and disappointing results in early experiments. The exception was the application of the Ruby Laser in retinal surgery in the mid-60. In 1964, the Argon Ion Laser was developed. This continuous wave 488nm (blue-green) gas laser was easy to control, and it's high absorption by hemoglobin made it well suited to retinal surgery, and clinical systems for treatment of retinal diseases were soon available. In 1964, the Nd:YAG (Neodymium: Yttrium Aluminum Garnet) Laser and CO2 (Carbon Dioxide) Laser were developed at Bell Laboratories. The CO2 laser is a continuous wave gas laser, and emitted infrared light at 10600nm in an easily manipulated, focused beam that was well absorbed by water. Because soft tissue consists mostly of water, researchers found that a CO2 laser beam could cut tissue like a scalpel, but with minimal blood loss. The surgical uses of this laser were investigated extensively from 1967-1970 by pioneers such as Dr. Thomas Polanyi and Geza Jako, and in the early 70's, use of the CO2 laser in ENT and gynecologic surgery became well established, but was limited to academic and teaching hospitals. Dye Lasers became available in 1969, and noble gas-halide, or Excimer Lasers in 1975. Since then, many other different laser systems have become available for industrial scientific, telecommunication, as well as medical use. The single most significant advance in the use of medical lasers was the concept of "pulsing" the laser beam, which allowed selective destruction of abnormal or undesired tissue, while leaving surrounding normal tissue undisturbed. The first lasers to fully exploit this principal of "selective thermolysis" were the Pulsed Dye Lasers introduced in the late 1980's for the treatment of port wine stains and strawberry marks in children, and shortly after, the first Q-switched lasers for the treatment of tattoos. Another major advance was the introduction of scanning devices in the early 1990s, enabling precision computerized control of laser beams. Scanned, pulsed lasers revolutionized the practice of plastic and cosmetic surgery by making safe, consistent laser resurfacing possible, as well as increasing public awareness of laser medicine and surgery. Medical lasers have made it possible to treat conditions which previously were untreatable,

Fundamental of Laser :- The term laser is an acronym of the first letters of the words, light amplification by stimulated emission of radiation. Laser is described as a source of electromagnetic radiation which emits beams of energy that include wavelengths from the ultraviolet portion of the optical spectrum to the far red. Laser radiation is considered as non-ionizing radiation because laser does not affect atoms of the biological tissue, while ionizing radiation can strip the electrons of the atoms and create radicals which can change the nature of the molecules and damage the tissue. Non-ionizing radiation, instead, increases the electron energy which typically results in heating or secondary light emission called fluorescence.

Laser Component: Each laser system consists or the three physical components:

Active Medium: Laser radiation is generated in an active medium, which can be solid, liquid or gas. Only certain types of media have the necessary optical, mechanical, atomic and/or molecular characteristics to make laser activity possible. For laser action to occure, the majority of molecules in the active medium have to be brought to a higher energy level simoultaneously. The excitation of the active medium can be done with variety of energy sources. These power sources elevate the molecules to an excited state and create a condition known as population invertion. This condition occurs when energy is poured into the active medium so rapidly that most molecules absorb excess energy. Once this excited state is reached, the molecules are primed to have this energy amplified and released.

Energy Source: The energy source provides the excitation mechanism for priming and focusing the molecules in the active medium. These energy sources can include electrical discharge, chemical reaction, and high power light source (flash lamp). The type of the active medium will determine the nature of the needed excitation device. In general, electrical discharges are needed for gas media (He-Ne, Argon, krypton, etc...), chemical energy mechanism for liquid media, and powerful light source I'm crystalline and solid state media.

Resonant cavity: The resonant cavity is the area in the laser where the primary laser activity occurs. The main housing in a laser consist of a short cylinder with mirrors placed on either end. The space between these two mirrors is filled with the excited molecules from the active medium. This space is called the resonant cavity because photons produced by the energized medium move back and forth between the mirrors becoming more amplified. One of the mirrors is only partially silvered to allow some light to leave the cavity and escaped as a focused beam. The degree to which this mirror this mirror allows light to pass depends upon the type of medium being used, the power input from the energy source and the wavelength of the photons in the cavity. Laser is designed so that enough reflected light is reflected back into the cavity to allow the lasing action to continue.

Characteristic of Laser Light: Although lasers vary in size and intensity, all laser radiation has fundamental characterstics, which distinguish it from natural light. Each of these properties is important for the many scientific, medical and industrial applications of laser.

- **Mon chromaticity:-** Natural light is composed of a combination of all visible and non visible wavelengths (colors). Laser light is described as a monochromatic light source because it consists of only one uniform color found on an extremely narrow band in the optical spectrum.
- **Directionality:-** This is one of the very unusual properties of laser light. Laser beam does not expand or disperse as easily as the natural light. The angle of divergence (the rate at which light spreads as it moves away from the source) is small. This makes the laser beam more hazardous than conventional light sources because it maintains the intensity over much longer distances.
- **Coherence:-** The light waves in a laser beam leave the resonant cavity in phase with each other. This uniform spatial relationship between the waves (coherence) amplifies the duration and energy of the beam. (V.Ccel ,Wriglit, John, C, Fissure Laser Surgery In Gynecology).

Laser Tissue Interactions:-Effects Of Tissue on Light

- Reflection and back scattering from the first surface.
- Transmition through the tissue.
- Scattering within the tissue.
- Absorption by the tissue. (Neims, M, H, Laser tissue interaction, 1996)

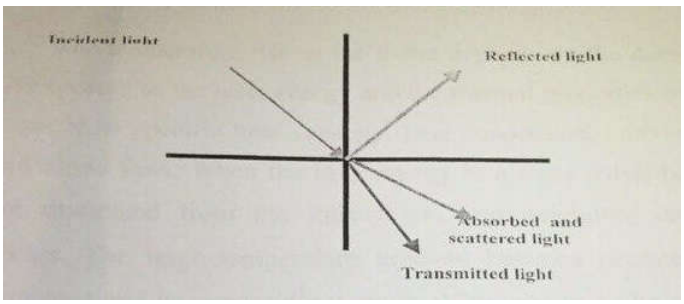

Figure (1-5) diagram showing the effect of tissue on light (Neims.M.H, 1996)

Mechanism of The Biological Effects:- The bioeffect of surgical laser may be wavelength dependent or wavelength independent mechanism.

Table 1.1 Thermal effects of laser radiation

Temperature/°c	Biological effect
45 – 50	Damage to enzymes and cell membranes
60	Proteins denaturation
100	Vaporization
>150	Carbonization
>300	Melting

Pholoilicrmal: (Table 1.1)

Wavelength Dependant Interaction Mechanism:

Photocoagulation: The temperature rise in the tissue depends on the duration of exposure to the laser energy and the thermal properties of the tissue, ie, its specific heat capacity, heat conduction, convention and blood flow. When the laser energy in a short pulse, heat is not dissipated from the impact site and negligible cooling occurs. The large temperature gradient between the laser spot and its surroundings cause ablation with no heating of the surrounding tissue. When energy is applied over a longer period, the heat spreads to surrounding tissue in a spherical pattern. (Neims.M.H, Laser tissue interaction, 1996). When the critical temperature Tc is reached, irreversible tissue damage occurs. As the temperature rise to 45°C-50°C, there is damage to the enzymes and the cell membrane accompanied by edema formation. At 60°C protein denaturation occurs. (Table 1.1). (Neims.M.H, Laser tissue interaction, 1996) *Vaporization and Cutting:At 100°C, the strong absorption of infra red radiation by water leads to boiling of the tissue water, cell rupture, dehydration and tissue shrinkage, beyond 150°C carbonization occure. Temperature beyond 400°C is associated with vaporization, burning and excavation. *Melting: :-When laser energy rises the tissue temperature more than 300°C. Intracellular and extra cellular tissue proteins and collagen begin to denaturate. (V.Ccel, Wriglit, John, C,Fissure Laser Surgery In Gynecology) *Photoablation: It is due to a photo thermal interaction of the laser beam with the tissue, which is due to thermal stress.

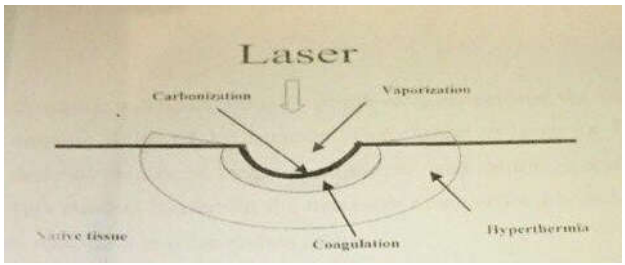

Figure 1-6. Diagram showing the heat spread to the surrounding tissue (V. Ccel , Wriglit, John, C, Fissure Laser Surgery In Gynecology)

Photochemical It includes:

Photo ablation:- This interaction occurs with shorter wavelengths like in UV region, where the high photo energy is absorbed, the energy gain is high enough to excess the electronic state to exceed the bond energy causes a bond break which leads to dissociation so the atom will occupy larger volume, bigger than the size of the tissue and this will lead to photoablationdue to volume stress. (V.Ccel ,Wriglit, John, C, Fissure Laser Surgery In Gynecology) *Photodynamic therapy:- PDT is a kind of a phototherapy by which the interaction of a photo sensitizer like 5-amino leuvolinic acid with an adequate light leads to production of cytotoxic substance (mainly single oxygen) causing the tissue damage followed by necrosis. The choice of laser for PDT depends

mainly on the photosensetizer used for this procedure. This method is used for the treatment of superficial lesion such as dysplasia and carcinoma insitu. *Laser biostimulation :-Laser light of low power density is successfully used in many cases for biostimuation of wound healing and the treatment of pain particularly good result have been reported with red light from the He- Ne and diode laser. (V.Ccel,Wriglit, John, C, Fissure Laser Surgery In Gynecology) II-wave Length Independent Mechanism

The physical effects associated with optical break down are plasma formation and shock wave generation if break down occurs inside tissue or fluid, cavitations and shock formation may additionally take place. Here the power densities exceeding 10^{11} in solid and 1OW/C^2 to the power 14 W/C^2 in air, the optical breakdown is clearly visible once an ultra short time laser used i.e. T is within picoseconds or femtoseconds. (V.Ccel , Wriglit, John, C, Fissure Laser Surgery In Gynecology)

Optimal Surgical Principle: The objective of any surgery irrespective to instrument used to perform it should be the removal of the un wanted tissue with adequate homeostasis and minimum destruction of adjacent healthy tissue. I -Acurate removal of the diseased tissue. This depends primarily on the surgeon's ability to see what is he or she doing and to control the shape and size of the excised or ablated tissue in three dimensions. 2-Minimization of the thermal damage to adjacent tissue. The surgeon should always use the highest power density in the laser beam that is compatible with his or her level of mind-hand coordination with out unintended removal of surrounding tissue, the total time of exposure to the laser beam should be minimized. To enhance achievement of this object, the laser should be either an inherently pulsed type or a continuous wave laser used in a pulsed mode. Using the right laser for the procedure. Because there is no single laser (wavelength) that will perform any kind of surgery optimally; laser type should be chosen according to surgical operating need.

Laser application in gynecology:- lower genital tract:- Cervical lesions: Was one of the popular methods for the treatment of patients with CIN Since the late 1970s, cervical lesions, including CIN, carcinoma in situ (CIS), and condyloma have been treated with the CO2 laser. By using the colposcope, the CO2 laser can be micromanipulator, it can he used to direct the laser delivered to the desired site in a very precise way. A beam is applied to vaporize the lesion under direct vision with adequate margin and depth. Prior to laser, the popular method for treatment of patients with CIN was cryotherapy. Laser treatment was found to have fewer adverse effects and sequel; however, performing adequate laser surgery requires an understanding of laser principles and familiarity with the handling of instruments via a colposcope.

Laser treatment of cervical lesions employs the following 2 methods: *Vaporization of the lesion: this method includes the entire squamocolumnar junction and transformation zone. It is usually used in the treatment of patients with CIN I, II, III and CIS. Laser conization, (excisional cone): this method usually is used in patients with CIN type Ill or CIS. A cone shaped piece of cervical tissue is removed using the laser beam as a knife. The pathologist can evaluate the specimen for the margin and depth of involvement. Cervical condylomata can also be treated with a CO2 laser (e.g. CIN lesions), except the required depth of vaporization is only 2-3 mm.

Vaginal lesions: Patients with vaginal condylomata can be treated with excision if they have only a solitary large lesion. Laser vaporization is better suited for multiple and smaller lesions. The laser can be guided via colposcope or a handheld tip. Vaporization of vaginal condyloma should not be too deep because condyloma is a surface lesion. Vaporization of the superficial epithelial layer with at least 1 cm of margin around the lesion is adequate. The advantage of using the CO2 laser is the ability to treat a large area without causing a scar, stricture, or narrowing of the lumen (Townsend, 1982). Deep penetration with an electric instrument (e.g. LEEP) may injure the organs underneath the vaginal wall (e.g. rectum, bladder) (Powell, 2000). Obtain a biopsy with an adequate margin in a solitary VAIN lesion; therefore, performing an excision with a knife is best.

Vulvar lesions: Many vulvar lesions have been treated with the CO2 laser, with good results. Vulvar condyloma and VIN, including vulvar CIS, have been treated successfully with the CO2, laser (Baggish 1981; Leuchter. 1984: Sideri, 1999) Ablation of the dermis layer is adequate for condyloma. VIN lesions require a slightly deeper ablation (2-3 mm). Vaporization of the skin that is too deep causes scarring (Reid 1985). Washing the lesions with 5% acetic acid can aid in identifying the involved areas. Laser ablation should he performed approximately 1 cm beyond the margin of the lesion to decrease recurrence. As reported by Penna, either vaporization or excision with laser was used for the treatment of VIN; they were effective in a single treatment in 76.9% and 78.4% of cases, respectively. Second laser treatment for recurrent VIN achieved a total of 96% cure. All cases were performed at ambulatory setting under local anesthesia (Penna, 2002). Laser excision for VIN-3 has the advantage of helping to rule out any invasion. Case reports of treatment of other vulvar lesions (e.g., molluscum contagaiosum, lichen sclerosis atrophica, chronic vestibulitis, and other dermatologic lesions) with the CO_2, laser suggest good results (Kaufiman, 1985; Kartamaa, 1997; Reid, 1991).

Hysterroscopy

Endometrial laser ablation: The endometrium possesses amazing powers of regeneration. It is necessary to destroy the pars basalis and its glands to prevent regrowth .The neodynium: yttrium aluminum garnet (Nd-YAG) laser penetrates tissues to grater depth than currently available lasers it produces tissue coagulation necrosis for about 4-5mm in. All directions around the zone of vaporization. Such depth of spread should insure that when the beam is applied suitably prepared and thinned endometrium, the full thickness of the endometrium and the superficial myometrium are destroyed without threatening the integrity of the outer myometrium, which is 20mm thick. Hysteroscopic laser surgery can also be used in treatment of:

- sub mucous fibroid.
- Endometrial septum.
- Benign endometrial polyp.

Abdominal and laparoscpic procedures:

Endometriosis Advanced operative laparoscopy in general, and videolaseroscopy using CO2 laser via operative channel of the laparoscope and video, specifically, has revolutionized the management of endometriosis.

Adhesion formation is reduced and subsequent fertility rates exceed those obtained with laparotomy. The most complicated cases of endometriosis, including involvement of the rectovaginal septum, gastrointestinal, and urinary tract, can now be treated endoscopically by an experienced operative laparoscopist •

Myomectomy:-Myoma can be removed by vaporization or excision. A micro laser myomectomy provides better hemostasis and precision in removing the fibroid. • **Ovarian cysts and tumors**:-These can be excised and vaporized with similar benefit. The ability to vaporize the tissue with minimal surrounding damage, even when associated with dense and extensive tissue adhesion, has proven of great value for patients with PID. • **Polycystic disease of the ovary** :-This is treated by making small incisions of 2-3mm through the capsule of the ovary. This destroys the ovarian stroma and reduces the androgen production.

Other uses of laser in laparoscopy and abdominal surgery include:

- Ectopic pregnancy.
- Cornual reimplantation.
- Utero sacral ligament transaction.

Wound Healing:-Photostimulation of the wound healing remain the cardinal indication of therapeutic laser in physiotherapy. In gynecology low level laser therapy used in treatment of cervical erosion, vaginal wound healing using He-Ne laser (632.8nm, 5m watt) with or without photosensitizer like gention violet.

Safe use of laser in surgery:- Laser Classification :- The laser is designed as one of the four general clases according to the American National Standards (ANSI). It is not the laser itself but the whole system that is given the class number. Individuals who operate lasers should follow the guidelines to protect both themselves and others in the area. Supervisors and operators should be properly trained before working with or around Class 2, 3, and 4 lasers Features of a laser device, such as power output, beam diameter, pulse length, wavelength, beam path, beam divergence, and exposure duration determine the capability for injuring personnel. The potential for injury from use of a laser is determined by its classification; therefore, the control measures are also determined by laser class. Concepts such are maximum permissible exposure (MPE), optical density (OD) and nominal hazard zone (NHZ) are important for laser operator to use and understand.

Maximum permissible exposure:-MPE is the maximum level of laser radiation to which a person may be exposed without hazardous effects or biological changes in the eye or skin. The MPE is determined by the wavelength of laser, the energy involved, and the duration of the exposure.

Optical Density (OD): The OD (absorbance) is used in the determination of the appropriate eye protection.

Normal Hazard Zone (NHZ): The NHZ relates to the space within which the level of direct, reflected, or scattered radiation during normal operation exceeds the appropriate MPE. Exposure levels beyond the NHZ are below the appropriate MPE level, thus no control measures are needed outside the NHZ.

Hazard classification also includes the following parameters:

• The wavelength of the laser. • The average power output of the laser and the duration of exposure within an eight hour working day to beam emission. • The total energy per pulse (for pulsed laser), pulse duration, pulse repetition rate, frequency and pulse energy emission. ANSI-ZI36.1 categorize laser into four safety classes (Laser Safety Manual-Boca Rotan, FL) Control Measures by Laser:- Classification:- Potential hazards exist to all individuals working near a laser system. Such individuals should be warned of the existence and location of lasers, and of the meaning of the warning labels for all classes of lasers. Particular attention should be given to the environment where the laser is used. This factor should be considered together with the class and application of the laser for determining the control measures to be applied. Basic elements to be considered are:

Number and class of lasers: Laser location:-Presence (access) of uninformed, unprotected personnel Presence of objects that may have specular surfaces or reflecting objects near the beam path Use of optical devices or such as lenses, microscopes. *Control measures may be broken down to two types: administrative controls, such as signage, procedures, etc., and engineering controls, such as beam housings, shutters, etc. The following are general considerations for work with lasers, per laser hazard class. (V.Ceel .Wright,John,C,Fissure Laser Surgery In Gynecology)

Class 1 :-Many Class 1 lasers have higher class lasers enclosed within a protective housing. If the Class 1 laser has an enclosed Class 3b or 4 laser, interlocks should be provided on any removable parts of the housing, or the laser should have a service access panel that is either interlocked or requires a tool for removal. If the protective housing is removed, control measures appropriate for the enclosed laser class should be followed. All class 1 lasers must be labeled.

Class 2:-Class 2 lasers must be labeled. The laser beam should not be purposefully directed toward the eye of any person. Alignment of the laser optical systems (mirrors, lenses, beam deflectors, etc.) should be performed in such a manner that the primary beam, or specular reflection of the primary beam, does not expose the eye to a level above the MPE for direct irradiation of the eye. The work area should be posted with a warning label or sign cautioning users to avoid staring into the beam or directing the beam toward the eye of individuals. If the MPE is exceeded, design viewing portals and/or display screens to reduce exposure to acceptable levels. If the Class 2 laser has an enclosed Class 3b or 4 laser, interlocks should be provided on any removable parts of the housing. If the protective housing is removed, control Measures appropriate for the enclosed laser class should be followed.

Class 2 laser equipment: CAUTION, laser Radiation (or laser symbol), Do Not Stare Into Beam (V.Ccel, Wriglit, John, C, Fissure Laser Surgery In Gynecology)

Class 3a:-Class 3a lasers must be labeled accordingly. The work area should be posted with a warning label or sign cautioning users to avoid staring into the beam or directing the beam toward the eye of individuals. Removable parts of the housing and service access panels should have interlocks to prevent accidental exposure.

Figure 1.7. Avoid staring into the beam

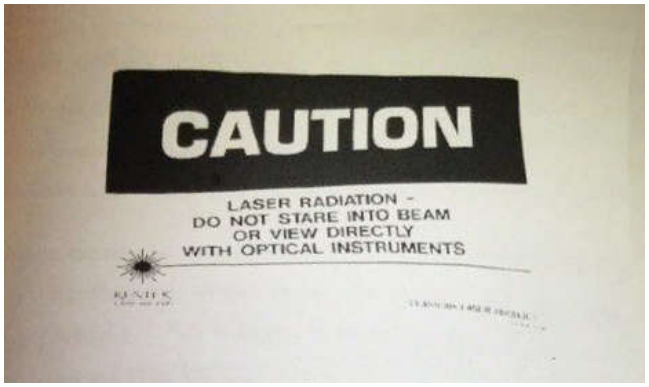

Figure 1.8.do not stare into beam

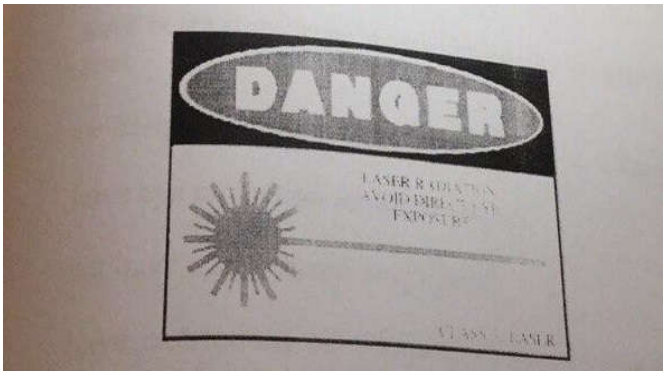

Figure 1.9.laser radition

A permanent beam stop or attenuator may also be used. If the MPE is exceeded, design viewing portals and/or display screens to reduce exposure to acceptable levels. Alignment procedures should be designed to ensure the MPE is not exceeded.

Class 3a laser equipment, below MPE: Danger, Laser Radiation (or laser symbol), DO Note Stare into Beam or View Directly with Optical Instrument (V.Ccel, Wriglit, John, C, Fissure Laser Surgery In Gynecology)

Class 3a laser equipment, above MPE: DANGER, Laser Radiation (or laser symbol), Avoid Direct Eye Exposure (V.Ccel, Wriglit,John,C,Fissure Laser Surgery In Gynecology) Class 3b lasers and laser systems must he labeled accordingly. These lasers are used in areas where entry by unauthorized individuals can be controlled. If an individual who has not been trained in laser safety must enter the area, the laser operator or supervisor should first instruct the individual as to safety requirements and must provide protective eyewear, if required.

Figure 1.10. provide protective eyewear

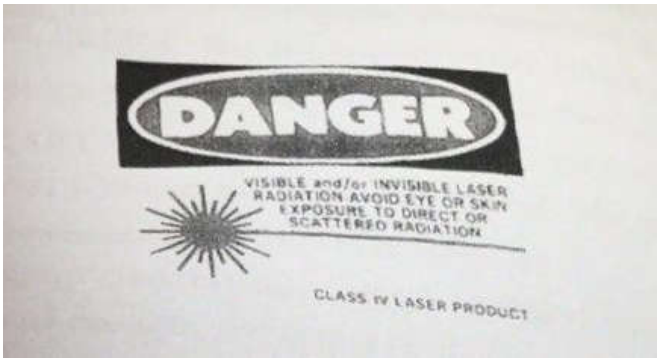

Figure 1.11.avoid eye or skin exposure

If the entire bear is not enclosed or if a limited open beam exists, the laser operator, supervisor or laser safety officer should determine (NHZ). An alarm, warning light should be used during use or startup of the laser.

The controlled area should

- Have limited access to spectators,
- Have beam stops to terminate potentially dangerous laser beams,
- Be designed to reduce diffuse and specular reflections,
- Have eye protection for all personnel,
- Not have a laser beam at eye level,
- Have restrictions on windows and doorways to reduce exposure to levels below the MPE,
- Require storage or disabling of the laser when it is not being used

If the MPE is exceeded, design viewing portals and/or display screens to reduce used, exposure to acceptable levels. Alignment procedures and collecting optics should be designed to ensure the MPE is not exceeded. Only authorized, trained individuals should service the laser. Approved, written standard operating, maintenance and service procedures should he and followed.

Class 3b equipment: DANGER, Laser Radiation (or laser symbol), Avoid Direct Exposure to Beam. (V.Ccel, Wriglit,John,C,Fissure Laser Surgery In Gynecology)

Class 4:-In addition to the control measures described for Class 3b, Class 4 lasers should be operated by trained individuals in areas dedicated to their use. Failsafe interlocks should be used to prevent unexpected entry into the controlled area, and access should be limited by the laser operator to persons who have been instructed as to the safety procedures and who are wearing proper laser protection eyewear when the laser is capable of emission.

Laser operators are responsible for providing information and safety protection to untrained personnel who may enter the laser controlled areas as visitors.

The laser area should be:

- Restricted to authorized designed personnel only
- Designed to allow for rapid emergency egress
- Equipped with a device that allows for deactivation of the laser or reduction of the output to below the MPE
- Designee to fulfill Class 3b controlled area requirements
- Designed with entry safe controls
- Designed such that the laser may be monitored and fired from a remote location
- (For pulsed systems) have interlocks design to prevent firing of the laser by dumping the stored energy into a dummy load
- (For continuous wave systems) have interlocks designed to turn off the power supply or interrupt the beam by means of shutters. The beam path must be free of specularly reflective surfaces and combustible objects and the beam terminated in a non-combustible, non-reflective barrier or beam stop.

Equipment: DANGER, Laser Radiation (or laser symbol), Avoid Eye or Skin Exposure to Direct or Scattered Radiation. (V.Ccel, Wriglit, John, C, Fissure Laser Surgery In Gynecology)

Types of laser hasard:- There are four types of laser hazards: 1- Equipment hazard: The goal of laser therapy is to produce denaturation of the tissue using a laser beam that develop sufficient intensity to produce the desired effect within the treatment area. However, measures must be taken to ensure emission outside the treatment area are so attenuated in their intensity that they pose no hazard to the laser operator and other personnel. 2-Elictrical hazard: There is a potential danger from the high power densities inside the main power box of the laser, the high voltage can cause pain, burns, ventricular fibrillation and death. 3-Biological hazard: The eye is particularly vulnerable, since the ocular lens can focus the laser light to highly concentrated spot on the retina. All UV wave lengths exerts a biological effect: _ UV-A laser 315-389nm, penetrates several mm into the skin and can cause pigmentation and can cause cataract. _ UV-B ranging 280-315nm, cause erythema and secondary pigmentation of the skin and ocular exposure cause photokeratitis. _ UV-C in the range below 280nm can penetrate only in the superficial tissues and its effect is similar to that UV-B. the injurious of IR laser occupying the range between visible and microwave region are entirely thermal in nature.

IR-A range 780-1400nm is especially hazardous to the eye because it can penetrate to the retina without producing retinal impression of light. _ IR-B range 1400-3000nm is so strongly absorbed by water in the anterior segment of the eye that it cannot reach the retina, but it can produce cataract when absorbed by the lens. _ IR-C 3000- 1000 000 nm is very strongly absorbed by water and is stopped at 1mm penetration. 4- Chemical hazards: therapeutic laser has sufficient intensity to ignite flammable materials. Brakedown products generated laser treatment can also jeopardize the health of patients and personnel.

Aim of the Study: The aim of study is to evaluate the effect of diod laser vaporization in treating CIN II of the cervix.The cervix (from Latin "neck") is the lower, narrow portion of the uterus where it joins with the top end of the vagina. It is cylindrical or conical in shape and protrudes through the upper anterior vaginal wall. Approximately half its length is visible with appropriate medical equipment; the remainder lies above the vagina beyond view. It is occasionally called "cervix uteri", or "neck of the uterus".

MATERIALS AND METHODS

This study was done in Al-Yarmuk Teaching hospital to study the effect of evaporation by using diode laser in treating CIN stage II. During the period between September 2006- April 2007, a total of 74 women (between ages of 22 to 51 who were married and sexually active) were undergone screening by Pap iv smear According to Bethesda system the 74 women were grouped as follows:-

- **Group 1:** Consist of 41 cases, most of them with simple inflammation ASC-US.
- **Group 2:** Consists of 18 women with LGSIL (CIN I)
- **Group 3:** Consists of 15 women with HGSIL (CIN II)

- History and Examination:-This includes the name, age, last menstrual period, menstrual history, previous Pap smear, marital state, duration of marriage, number of children, history of contraception, smoking, and the number of marriages (multiple sexual partners). While the examination includes, general examination and pelvic examination using the bivalve speculum.
- Lab. Studies: these include Pap smear and punch biopsy taken with aid of colposcopy.

Pap smear:-The best way to detect CIN is by having regular Papanicolaou tests, or Pap smears. (Pap is a shortened version of the name of the doctor who developed the screening test.) Which is a microscopic examination of cells taken from the cervix. A Pap smear can detect certain viral infections (such as human papillomavirus [HPV] and other cancer-causing conditions. Early treatment of these conditions can stop cervical cancer before it fully develops. The incidence of cancer and deaths from cervical cancer has significantly declined over the years because prevention, screening, and early detection by the Pap smear. In the United States, about 2-3 million abnormal Pap smears results are found each year. Most of them indicate the early stages of disease and need reasonable observation by a doctor. Cervical cancer screening is recommended yearly starting when women aged 18 years, or when they become sexually active if younger than 18 years. Physicians may screen a woman less frequently if she had negative Pap smear results 3 years in a row or is not sexually active. No upper age limit for screening exists because the incidence of cancer of the cervix increases with age at a time when women may be less likely to get a Pap smear. (Wright TC 1990) The National Cancer Institute encourages women aged 65 years and older to get a Pap smear at least every 2 years and every year if they are at higher risk and advised by their doctor. Many older women believe they no longer need Pap smears (and think they are not at risk for cervical cancer) because of their age, because they may not be sexually active, or because they have had a hysterectomy. That is not correct. These women need Pap smears because their risk is higher. If

woman has had her uterus removed, she should still have yearly screening if there is a history of abnormal Pap smear results or pther lower genital tract cancer. The Pap smear procedure is not complicated or painful. They only risk is not detecting cervical cancer in time to treat and cure it.

Pap smear preparation :-The beat time to have a Pap smear is when the woman is in the midcycle. For 2 days before the test, avoid the following because these might hide any abnormal cells:

- Intercourse
- Vaginal douches
- Vaginal medications (except as directed by the doctor)
- Vaginal contraceptives such as birth control foams, creams, or jellies.

Procedure: The woman should lie on the examination table with lithotomy position and by use of a small metal or plastic bivalve speculum to open the vagina so that the walls of the vagina and cervix can be seenclearly. • A sample of mucus and cells will be obtained from the cervix and endocervix using a wooden scraper (Ayers spatula) after cleaning the area from secretion with a large swab. • The sample of cells is evenly applied to a glass slide and sprayed with a fixative. This sample is sent to the lab for close and careful examination under a microscope. A Pap smear should not be painful. If experiencing pain during the test, the woman should tell her doctor. (Taking good care of yourself. thinPrep Pap test. Cyttyc Corp, accessed 2001). A negative or normal test finding means that the cervix looks healthy. All the cells are of a healthy size and shape. A positive or abnormal test finding means that something unusual is in the sample. The test found cells of a different size and shape.

- An abnormal Pap smear result does not always indicate cancer. Cells sometimes appear abnormal but are not cancerous. The woman will have to return to the clinic for follow-up care.
- An infection of the cervix may cause a positive test result. A yeast, trichomonas, chlamydial, or gonorrheal infection can cause the cervical cells to appear inflamed. After the infection is treated, the Pap smear result usually returns to normal.
- Haman papillomavirus (HPV) can also cause a test result to be positive. This virus may exist on the cervix or in the vagina and cause genital warts.
- The smear result may be positive because it shows changes that may become cervical cancer.
- Most laboratories use a standard set of terms called the Bethesda system to report, or interpret, test results. Under the Bethesda System, Pap smear samples that have no cell abnormalities are reported as "negative for intraepithelial lesion or malignancy" (meaning the woman does not have cancer). samples with cell abnormalities fall into the following categories (as outlined by the National Cancer Institute).
- ASC (atypical squamous cells): Squamous cells are the thin, flat cells that form the surface of the cervix. The Bethesda System divides this category into the following 2 groups:
- ASC-US (atypical squamous cells of undetermined significance): The squamous cells do not appear completely normal, but doctors are uncertain what the cell changes mean. Sometimes the changes are related to HPV infection. ACS-US are considered mild abnormalities.
- *ASC-H (atypical squamous cells cannot exclude a high-grade squamous intraepithelial lesion): The cells do not appear normal, but doctors are uncertain what the cell changes mean. ASC-H may be at higher risk of being precancerous.
- AGC (atypical glandular cells): Glandular cells mucus-producing cells found in the endocervical canal (opening in the center of the cervix) or in the lining of the uterus. The glandular cells do not appear normal, but doctors are uncertain what the cell changes mean.
- AIS (endocervical adenocarcinoma in situ): Precancerous cells found in the glandular tissue.
- LSIL (low-grade squamous intraepithelial lesion): Low grade means there are early changes in the size and shape of cells. The word lesion refers to an area of abnormal tissue. Intraepithelial refers to the layer of cells that forms the surface of the cervix. LSILs are considered mild abnormalities caused by HPV infection.
- HSIL (high-grade squamous intraepithelial lesion): High-grade means that there are more marked changes in the size and shape of the abnormal (precancerous) cells, meaning the cells look very different from normal cells. HSILs are more severe abnormalities and have a higher likelihood of progressing to invasive cancer. (Pap Test and Colposcopy Questions and Answers. McKinley Health Center. Accessed 1999).

Follow up:-If a woman's Pap smear result is normal, she will continue routine screening. If her Pap smear result is atypical (not able to be categorized as normal or abnormal), the test is repeated in 4 months. If the repeat test is abnormal, the doctor will do a colposcopy.

- In this test, the doctor looks at the cervix through an instrument called a colposcope (a lighted microscope) to look for an explanation for the abnormality in the Pap smear finding.

- The exam is not painful and has no adverse effects. It is possible to perform this exam during pregnancy. (Wright TC 2002)

- If there are abnormal cells on the cervix, the doctor will perform a biopsy (take a sample of the tissue to view under a microscope).

- If a woman's smear result is abnormal and suggestive of cancer, she will have colposcopy and biopsy tests performed.

- In a biopsy, the doctor will take a small sample of the tissue of the woman's cervix to see if cancer cells are present. A biopsy is the only way to determine if she has precancerous, true cancer, or neither.
- Several types of biopsies are performed under different types of anesthesia.
- To treat precancerous tissue or a very early cancer, the doctor may remove the abnormal tissue entirely during the biopsy.

- If both the biopsy and the Pap smear findings are normal, the Pap smear will be performed again in 4 months.
- If the biopsy finding is normal but a Pap smear finding is abnormal, the doctor will repeat the colposcopy and biopsy.
- If the biopsy finding is abnormal and suggestive of cervical intraepithelial neoplasia (CIN) or cancer, treatment will begin for cervical cancer. (Pap Test and Colposcopy: Questions and Answers, McKinley Health Center, Accessed 1999)

Colposcope: Colposcopy is the direct magnified inspection of the surface of a woman's genital area, including the cervix, vagina, and vulva, using a light source and a binocular microscope. Doctors use the test to evaluate potentially cancerous areas, typically after a Pap smear has indicated the possibility of such a problem. The doctor also may perform a biopsy (take a sample) of an abnormal area during the procedure.Colposcopy also can be used to detect inflammatory or infectious changes, harmless or cancerous growths, and traumatic injuries to the cervix, vagina, and vulva. (Leusley D, Leeson S: Colposcopy and programme management. Guidelines for the NHS Cervical Screening Programme. NHSCSP 2004)

Diagnostic procedure:

- Position the patient as comfortably as possible in the lithotomy position.
- Carefully insert a speculum of the appropriate size. For patient comfort, a water-based lubricant thinly applied to the speculum blades can be of benefit. This substance should not distort the subsequent evaluation in any way. Care should be taken to avoid any trauma to the cervix on insertion or opening of the speculum. Normal columnar epithelium and dysplastic epithelium can be very fragile, and even minor trauma from speculum placement can cause enough oozing of the blood to obscure findings.
- inspect the vagina and cervix visually with the naked eye. Gently remove any excess mucus or discharge with a large cotton-tipped applicator moistened with saline. Document any clinical findings on this gross inspection.
- Liberally apply 3-5% acetic acid with a large cotton swab saturated with the solution. This must be in place tor at least 60 seconds prior to inspecting for changes. If the evaluation takes more than 3-5 minutes, acetic acid should he reapplied because the cellular effects it creates are transient in nature.
- position the colposcope and focus on the cervix with the desired magnification (X15 is a good starting power).
- Inspect carefully to ensure that the entire TZ can be observed. Identify and document with drawings and description the presence of any acetowhite lesions and their internal vascular patterns. Use of the green filter at this point can improve the ability to identify lesion margins and vascular patterns.
- Ten percent of cervical carcinomas are adenocarcinomas of the endocervix, which are evaluated for by this test as well. An alternative technique to cytobrush sampling is endocervical curettage, which can be painful for the patient. Studies indicate that cytological endocervical sampling with a cytobrush has increased sensitivity but decreased specificity compared with endocervical curettage. Cytological sampling of the endocervix with a cytobrush requires specimen preparation as for a standard Papanicolaou test. For endocervical curettage, extra tissue not to the curette should be removed from the external os with small forceps and placed with the sample in fixative.
- Biopsy samples should be obtained from all lesions with any potential for invasion. Extensive experience is required before any individual clinician can be comfortable not performing biopsies on all acetowhite lesions. Biopsy samples can typically be obtained without the need for anesthetic, but its use is not precluded. Biopsy instruments should be of a 2-bladed type (e.g. Tischler, Burke, Kevorkian), in this study we used the volcellum to take the biopsy. Specimens should be removed from the instrument and placed in an appropriate fixative.
- A haemostatic agent can be applied to each biopsy site immediately after sample collection. Silver nitrate is effective measure. If multiple biopsies are indicated, initial samples should be taken from the inferior aspect of the cervix to prevent bleeding or chemical application from running down and obscuring adequate visualization.
- The speculum is removed, and patient instructions are provided. Spotting and a light discharge can be anticipated. Coitus should be avoided for 7-10 days, and a follow-up examination and discussion of pathologic findings should take place in 1-2 weeks.
- Many expert colposcopists also place Lugol solution (dilute iodine) on the cervix after initial examination and before any biopsies are obtained. This technique is based on the differential staining of cells with different glycogen content with this solution. Normal mature squamous cells have high glycogen content and typically stain a dark mahogany brown. Columnar cells and dysplastic cells have minimal glycogen and tend to stain mustard yellow. This reaction has high false-negative and false- positive occurrence, so the authors do not use it routinely. However, this step can be helpful in outlining lesions and the TZ if an excisional procedure, such as a LEEP, cone or laser is to be performed. In this setting, evaluation with the naked eye (after colposcopic correlation) can allow accurate selection of an appropriately sized loop to complete the procedure. (Stafl A, Mattingly R: Colposcopic diagnosos of cervical neoplasia. Obstel Gynecol 1973)

In this study we used the acetic acid only.

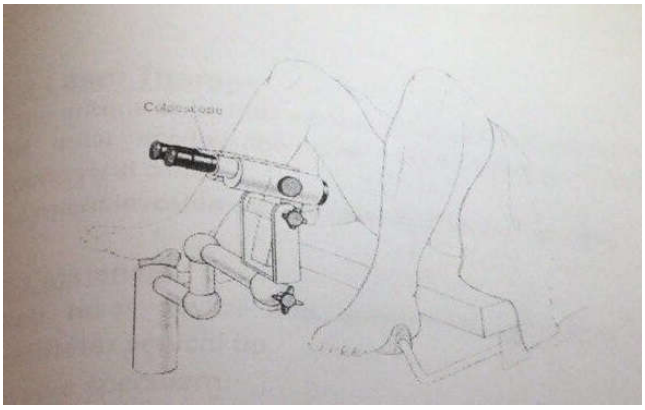

Figure 2. 1. The colposcopic positioning (Stafl A, Mattingly 1973)

Diagnostic procedures: Complication from colposcopy is exceedingly rare. Occasionally, some bleeding can occur following biopsy. This tends to be problematic only with procedures performed during pregnancy or with large excisional procedures. Infection of biopsy sites is also exceedingly rare, although it can occur following laser ablation or LEEP procedures. The most worrisome complication is inadequate or inaccurate evaluation leading to the missed diagnosis of invasive cancer. This obviously can lead to treatment delays and poorer outcomes. Another complication is the overestimation of lesion severity by inexperienced practitioners. This can put the patient on a treatment course that may not be necessary and has the potential for adverse sequeale. Many of these sequelae center around future fertility limitations such as cervical stenosis or incompetence. (Townsend D, Richard R: Diagnostic errors in colposcopy, Gynecol Oncol 1981: Oct; 12 (2 Pt 2): S259-64).

Laser Therapy: The criteria to be fulfilled must prior to laser therapy includes:

- CIN must occupy the ecto cervix, without extension to endocervical canal.
- The micro invasion and invasion must be eliminated.

Materials

- Diod laser device and accessories, fiberoptic with 600 micrometer conical tip.
- Bivalve speculum.
- Valium ampoule 10 mg.
- Google glasses used by the surgeon, assistant and the patient.

surgical laser system: The diomed surgical laser is delivering 15 Watt model of continuous wave laser radiation, the laser energy is delivered into the treatment site by mean of a flexible fiber optic coupled to the laser aperture. The diomed surgical laser incorporate laser IV Ga AIAs (Gallium Aluminum Arsenide) diode laser with a wavelength in range of 790-830 nm. And visible aiming beam 4 mWatt class IIIa diode laser with a wavelength in range of 630- 660 nm.

Diomed 15 Surgical laser: It is a diode laser at wavelength 810 nm, power out put 0.5-15Watt, treatment models are CW, pulsed and repeated pulse. pulse duration 0.1-9.9 sec, aiming beam is diode 635-660 nm.

Table 2-1. Technical classification of diomed 15

Laser type	Ga Al As laser diode
Cooling type	Forced air
Dimension	175 ×390×387 mm
Weight	12kg
accessories	600 micro m conical tip

Operative details

Positioning: The patient is placed in dorsal lithotomic position a speculum of a suitable size is used for full exposure of the cervix, the speculum must be of a dull surface to prevent the specular reflection of the laser beam. The patient is draped in damp towels to absorb any misdirected radiation and her eyes are protected with Goggles eye wear.

All personnel in the room should wear the Goggles eye glass. The cervix is bathed with 3% acetic acid solution and the cervical abnormalities are noted again before laser therapy.

Setting the Laser The dose Parameter for diode laser vaporization used in this work: Power 15 Watt Bare fiber 600 micro meter , Laser mode chopped , Exposure time 0.2 of the second , Operation time 15-20 minutes. The above doses used for vaporization of the CIN lesion with minimal thermal damage to adjacent area. The recommended distance for colposcopic examination is 30cm, which is equal to the focal length of the objective lenses.

The squamo columnar junction is identified and marked with laser beam at 12 o'clock anteriorly and 6 o'clock posteriorly and on both lateral sides at 3 and 6 o'clock, then the dots are connected together to make a circle that surrounds the cervical lesion, which must be surrounded by 3mm of normal appearing tissue. The next step is that the cervix is divided into four quadrants and each quadrant must be vaporized to the required depth before moving to the next. Vaporization done by moving the fiber optic joystick in such a way to draw vertical, horizontal and diagonal lines within the area to be vaporized.

Fllow up

- Pelvic rest (i.e., no tampone, douches or intercourse)
- Light activity for 3-5 days.
- Instruction to call if a foul vaginal discharge pelvic pain, fevers or excessive bleeding.

RESULTS

During the period from September 2006 to April 2007, 74 patients (married, sexually active) entered this study, the results of these women screened With Pap smear grouped according to the Besethda system as follow:

SIL grade	number of patients
ASC-US	41 - inflamation
LGSIL	18
HGSIL	15

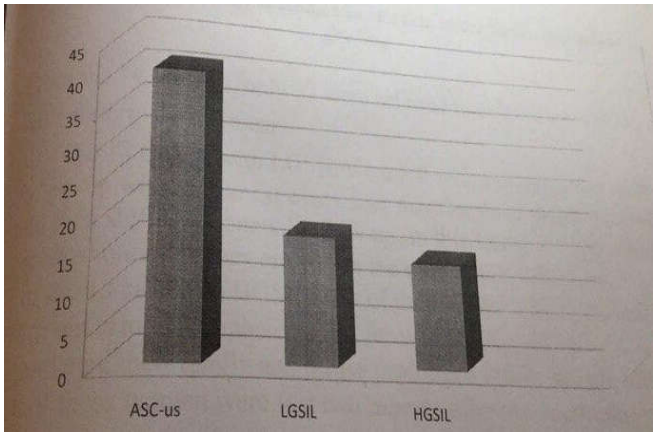

Figure 3-1. No. of women grouped according to Bethesda system

The average age for ASC-US was 29, while LGSIL was 32, and HGSIL was 38. From the 74 patients, only 33 were referred to colposcopy (those with abnormal Pap smear). The 18 patient with LGSIL were left without treatment with follow up with Pap smear every four months, three negative results

and then shifted for annual follow up. (in this study, the Pap smear repeated once and they are still in the program of follow up.

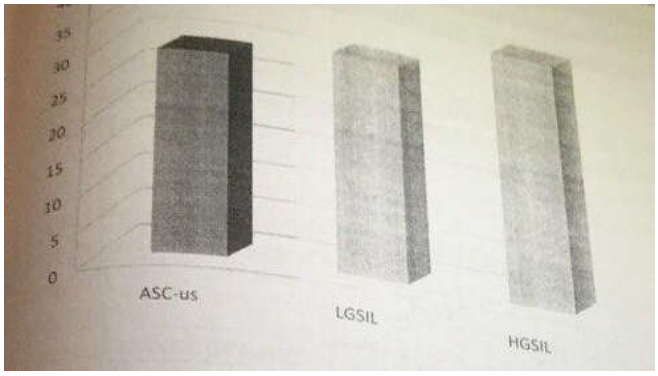

Figure 3-2. Age of women in relation to the Bethesda system grading

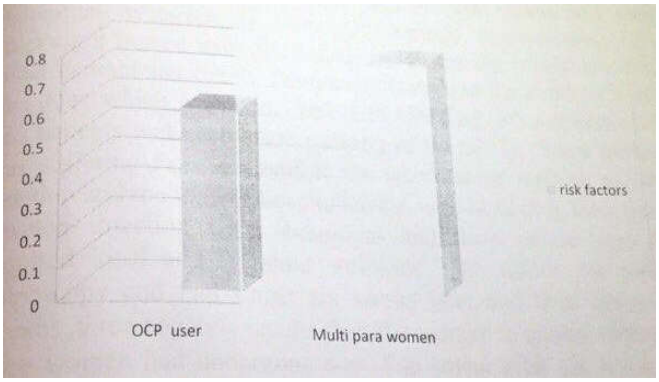

Figure 3-3. Percentage of cases of HGSIL in relation to risk factors

Table 3-1. Complication of laser treated cases

Number of laser treated cases	5
Bleeding	Non
Infection	1
Cervical incompetence	No report
Altered fertility	No report

Table 3-2. Complication of diathermy treated cases

Number of cases treated by cautery diathermy	8
Bleeding	2
Infection	2
Cervical incompetence	No report
Altered fertility	No report

For the 15 case with HGSIL, two of them ended with hysterectomy without salpingo oopherectomy, for women over 40 and completed their family and refuse prolonged follow up, the follow up of these women were lost two months after the operation. Five women submitted to laser therapy with diode laser, the first follow up was six weeks after the treatment, from these women only one showed recurrence , the other four women had only one chance for follow up for the time is too short and still they are in the follow up programs. The other eight Women were submitted to electro cautery diathermy with follow op after four months, two of them showed recurrence and the other six cases had the chance for follow up with Pap smear once and they are still in the follow up program. According to the complication (bleeding, at time of operation or 7-10 days after, infection, cervical stenosis or altered fertility)

DISCUSSION

Pap smear has proven to be effective in screening of CIN and reducing the mortality from cervical carcinoma. The goal in treating the CIN is to eliminate the abnormal cells either by ablation or excision before progressing to invasive carcinoma. Our concern here is the ablative treatment by laser and diathermy for CIN II cases. In this study we will compare between the results in treatment of cases of CIN II by laser and other eases CIN II also treated by electrocautery diathermy as an alternative method. The 18 women with CIN I were left without treatment, just with follow up for that most of cases will regress spontaneously. The follow up is usually by Pap smear every four months and colposcopic examination so that progression to CINII and CIN III will not be missed.

Women with CIN II were 15, according to the risk factor:

- 9 of them use oral contraceptive pills (60%)
- 12 of them were multipara and have more than 4 children (80%)
- Multiple partners have not been reported.

The laser therapy of the five women was done as an out patient procedure, the mode of laser was CW, the power was 15 Watt, exposure time was 0.2 sec and the depth was 7 mm depending on mucous bubbling. The time of work was 20 minute for all of the patients. Bleeding during the procedure has not been reported and if would occur then it would be treated by coagulation with the same laser by increasing the spot size and decreasing the power density. The patients discharged one hour after the operation. The other complication was infection at site of ablation in foem of acute cervicitis This was treated with local and systemic antibiotic at out patient with out the need for hospitalization. Other complication like cervical stenosis and infertility has not been reported because of the short time of follow up. Usually the ablative therapy has no effect on cervical incompetence and hence doesn't lead to pre term labor and premature rupture of membrane, unlike the excisional therapy that may lead to much loss of cervical tissue with the resultant of cervical incompetence. The study also included the conventual methods of treatment of CIN. For the other ten women, two of them ended with total abdominal hysterectomy without salpingo oopherectomy, the other eight treated with electrocauttery diathermy which was done under general anesthesia.

Deep cauterization to the depth of 7 mm was done which was associated with bleeding (intra operative) in two patients that necessitate packing of the cervix. Some patients was suffering from discomfort for which some women required sedatiol and the time of hospitalization was 24 hours. Two patient develop infection with abdominal and deep pelvic pain that required local and systemic antibiotic. The follow up was by t s colposcopy and Pap smear six weeks later and then every four months ,three negative results shift the women to annual follow up, these women had undergone one Pap smear after six weeks and still they are in the follow up program, two of these women has shown recurrence of dysplasia.

Conclusion

The diode laser vaporization has a place in the treatment on CIN II and it seams that the parameters used and the depth of treatment were suitable, the success rate of laser therapy (80%)

was slightly more than that of electro cattery diathermy (75%), with less infection and bleeding and less time of hospitalization.

Recommendation

Its better to use CO2 laser for such type of work because of the higher efficacy and because of its wave length, its very well absorbed by the living tissue. *Extend the time of follow interval up to four months till get three consecutive negative results then shift the patient to annual follow up.

List of Abbreviations

abbreviation	description
CIN	Cervical intraepithelial neoplasia
scc	Squamous cell carcinoma
HPV	Human papilloma virus
LGSIL	Low grade squamous intra epithelial neoplasia
HGSIL	High grade squamous intra epithelial neoplasia
ASC-US	Atypical squamous cells of undetermined significance
LEEP	Loop electrical excision procedure
CO2	Carbon dioxide
N2O	Nitrous oxide
nm	Nanometer
Nd:YAG	Neodymium: Yttrium aluminum Granet
CW	Continuous wave
KTP	
He-Ne	Helium Neon
Tc	Critical Temperature
PDT	Photo dynamic therapy
UV	Ultra violet
IR	Infra red
W	Watt
T	Time
CIS	Carcinoma insitu
VIN	Vulvar intra epithelial neoplasia
PID	Pelvic inflammatory disease
ANS	American national standard
OD	Optical density
MPE	Maximum permissible exposure
NHZ	Normal Hazard Zone
Pap	Papanicolaou
ASC	Atypical squamous cell
ACC	Atypical glandular cell
AIS	Adeno carcinoma insitu
TZ	Transformation zone
GaAIAs	Gallium Aluminum Arsenide

REFERENCES

Abu J., Davies Q. 2005. Endocervical curettage at the time of colposcopic assessment of the uterine cervix. *Obstet Gynecol Surv.,* may; 60(5): 315_20.

Agorastos T., Miliaras D, lambropoulos A, Chrisafi S, Kotsis A., Manthos A., Bontis J. 2005. "Detection and typing of human papillomavirus DNA in uterine cervices with coexistent grade I and grade III intraepithelial neoplasia: biologic progression or independent lesions?".Eur J Obstet Gynecol Reprod Biol 121 (1): 99-103. .

ASCUS-LSIL Triage study (ALTS) Group: Results of a randomized trial on the management of cytology interpretations of atypical squamous cells of undetermined significance. Am J Obetst Gynecol 2003 Jun; 188(6): 1383-92

Benedet JL., Anderson GH., Boyes DA. 1085. Colposcopic accuracy in the diangnosis of microinvasive and occult invasive carcinoma of the cervix Obstetric Gynecol Apr; 65(4): 557-6224.

Benjamin I., Echols L. 2001. The Pap Test: Cervical Changes and Health care. Oncolink. Available at.

Berek, J. 2002. Novak's Gynecology. 13th Ed. Lippincott, Williams and Wilins.

Brewer MA., Sbach A., Sandella J. 1999. Abnormal Papanicolaou smears and human papilloma virus. In: Glass RH, ed. Glass's Office Gynecology. Lippincott Williams & Wilkins; 226-32.

Bristow RE., Karlan BY. 1999. Disordrs of the uterine cervix. In: Danforth DN. Ed. Danforth's Obstetrics and Gynecology. 2nd ed. Lippincott Williams & Wilkins; 830-5.

Burke L., 1995. Colposcopy. In: Nichols DH, Sweeney PJ, eds. H. Boston, Mass: Harvard University Press :375-83.

Burke L., Antoniolo DA., Ducatman BS. 1991. Colposcopy Text and Atlas. Appleton & Lange;1.

Cecl wright, V. John, C. Fisher laser surgery in gynecology.

Coppleson M. 1987. Colposcopic features of papillomavirus infection and premalignant lesions of thr lower genital tract. *Obstet Gynecol Clin North Am.,* 14: 471-94

Coppleson M., Pixley E., Reid B. 1971. Colposcopy; a scientific and practical approach to the cervix in health and disease. Springfield, III: Charless C. Thomas.

DiSaia PJ., Creasman, WT. 1981. Perinvasive disease of the cervix, vagina and vulva. In: Clinical Gynecologic Oncology. St. Louis, Mo: Mosby: 1-38.

Forsberg JG. 1973. Cervicovaginal epithelium: its origin and development. *Am J Obstet Gynecol.,* Apr 1;115(7): 1025-43

Hatch KD., Shindgleton HM., Orr JW. Jr, et al. 1985. Role of endocervical curettage in colposcopy. . Obstet Gynecol. Mar. 65(3):403-8.

Hatch KD., Shingleton HM., Orr JW. Jr, et al. 1985. Role of endocervical curettage in colposcopy. *Obstet Gynecol*. Mar, 65(3):403-8.

Herbet AL. 1992. Intraepithelial neoplasia of the cervix. In: Comprehensive gynecology. 2nd ed. St. Louis, Mo: Mosby; 821-853.

Hillemanns P., Wang X., Staehle S., Michels W., Dannecker C. 2006. "Evaluation of different treatment modalities for vulvar intraepithelial neoplasia (VIN): CO(2) laser vaporization, photodynamic therapy, excision and vulvectomy". Gyncol Oncol 100 (2): 271-5.

Histology at BU 19404loa

Histology at USC rep/c_48

Kolstad P., Stafl A. 1972. Color plantes In: Atlas of Colposcopy. Baltimore, Md: University Park Press.

Koutsky LA., Ault KA., Wheeler CM., et al. 2002. A controlled trial of a human papillomavirus type 16 vaccine N Engl J Med 2002 Nov 21; 347(21): 1645-51.

Leusley D., Leeson S. 2004. Colposcopy and programme management. Guidelines for the NHS Cervical Screening programme. NHSCSP

Neimz, M. 1996. Hlaser tissue interaction, Heidelberg Germany

Noller K., Wagner A. 2000. Jr: Colposcopy. In: Sciarra JL, ed. Gynecology and Obstetrics. Vol 1. Philadelphia, Pa: Lippincott, Williams and Wilkins

Pap Test and Colposcopy: Questions and Answers. Mekinley health Center. Accessed 1999.

Papanicolaou G., Traut H. 1943. Diagnosis of nterine cancer by the vaginal smear. New York, NY: Commonwealth fund.

Park J., Sun D., Genest D., Trivijitsilp P., Suh I., Crum C. 1998. "Coexistence of low and high grade squamous intraepithelial lesions of the cervix: morphologic

progression or multiple papillomaviruses?". Gynecol Oncol 70 (3): 386- 91.

Rapp L, Chen J. 1998. "The papillomavirus E6 proteins". Biochim Biophys Acta 1378 (1): F1-19..

Reid R. 1989. Preinvasive disease. In: Practical gynecologic oncology.Baltimore, Md: Williams and wilkins 195-232 .

Reid R., Herschman BR., Crum CP. et al. 1984. Henital wrats and cervical cancer. V. The tissue basis of colposcopic change. *Am. J. Obstet. Gynwcol.,* ; 149(3) : 293-303

Reid R., Scalzi P. 1985. Genital warts and cancer. VII. An improved colposcopic index for differentiating benign papillomavirus infections from high grade CIN. *Am. J. Obstet. Gynecol.,* Nov 15;153(6): 611-18

Roberts JM., Gurley AM., Thurloe JK., et al. 1997. Evaluation of thr TjinPrep Pap test as an adjunct to the conventional Pap smear. Accessed.

Runowicz C. 1996. New Pap Test Technology. Health News.

Solomon D. Davey D., Kurman R. et al. 2002. The 2001 Bethesda System: terminology for reporting results of cervical cytology. JAMA Apr 24:287(16): 2114-9

Stafl A., Mattingly R. 1973. Colposcopic diagnosos of cervical neoplasia. *Obstet Gynecol.,* Feb; 41(2): 168- 76.

Stafl A., Mattingly R. 1975. Angiogenesis of cervical neophasia. *Am J O bstet Gynecol.,* Mar 15;121(6): 845-52

Taking good care of yourself. ThinPrep Pap test. Cytyc Corp. Accessed 2001.

Taking good care of yourself. ThinPrep Pap test. Cytyc Corp. Accessed 2001.

The Pap Test: Questions and Answers. National Cancer Institute. Available at http://cis.nci.nih.gov/fact/ 5_16.htm. Accessed2001.

The Pap Test: Questions and Answers. National Cancer Institute. Available at http://cis.nci.nih.gov/ fact/5_16. htm. Accessed2001.

Townsend D., Richart R. 1981. Diagnostic errors in colposcopy. *Gyneocol Oncol,* Oct; 12 (2 Pt 2): s259-64

Weschler, Toni, MPH, 2002. Taking Charge of Your Fertility. Second Edition, pg.59, 64.

Wright TC. 1990. Role of human papillomavirus in the pathogenesis of genital tract warts and cancer. *Gyneocol,* May;37(2): 151-64.

Wright TC., Cox JT., Massad LS. et al. 2001. Consensus Guidelines for the management of women with cervical cytological abnormalities JAMA 2002 Apr 24; 287(16): 2120-9.

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