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Review Article

MAMMARY DUCTOSCOPY FOR EVALUATION OF PATHOLOGIC NIPPLE DISCHARGE: REVIEW

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ABSTRACT

Most of the pathologic nipple discharge is mainly due to benign lesions, However malignant breast disease can cause around 15 % of pathologic nipple discharge. Breast disease mostly originates from epithelium of ductal lining. Conventional imaging only shows indirect images of lesions but mammary ductoscopy allows direct visualization of ductal epithelium which is the source of breast lesions and malignancies. Mammary ductoscopy is newly developed endoscopic technique that could treat pathologic nipple discharge by miniaturized endo-baskets or wires. The main aim of this study is to discuss a role of current ductoscopic techniques which enables diagnostic and therapeutic advances over breast disorders that cause nipple discharge.

Keywords: Ductoscopy, Mammary; Breast; Nipple discharge

INTRODUCTION

Pathologic nipple discharge is a unilateral and nonphysiological nipple discharge from a single duct. It is a discharge which is not associated with lactation. It is typically unilateral, spontaneous, uniductal and it may be serous or bloody. Benign as well as malignant breast diseases can cause PND. Patient with pathologic nipple discharge has diagnostic and therapeutic challenge to the surgical clinicians. The most common causes of PND are intraductal papillomas, responsible for around 40% of cases, ductal carcinoma in situ (DCIS) in 4-20% and other benign causes in up to 23%. The likelihood of malignancy is high in women more than 50 years presenting with a palpable mass. All women over 40 years with PND should have to do mammography to identify breast lesions. Ultrasound may be helpful in visualizing retro-areolar lesions. Ductal aspiration and ductography can be used to investigate the women with PND. Clinical uncertainty arises along with the abnormality on examination or imaging. However, there is low chance of malignancy with the PND, these women may require surgical excision of the duct for diagnosis. This recommendation is based on inadequate specificity and sensitivity of imaging or additional tests. These problems originate from a time when breast imaging was may be less sensitive or without an emerging intraductal technique known as ductoscopy. A ductoscope is an instrument which allows direct visualization of the mammary ducts using sub-millimeter fiberoptic micro-endoscopes inserted through the ductal opening of the nipple. Mostly it is used for localization of the lesion. Direct visualization aids in mapping of ductal structure in relation to the lesion, which enables accurate tissue sampling and guide to the surgeon during excision. It allows in screening individuals with high risk of breast cancers and also allows to do breast conservation surgery which helps in minimizing cosmetic deformity. In Pathological nipple discharge, as there was improvement in biopsy instruments and intraductal therapy such as intraductal excision and laser ablation, ductoscopy can able to target, locate and minimize surgery for selected patients.

It also helps in avoiding a surgical duct excision because most of these lesions are benign and if we could differentiate benign and malignant lesions endoscopically, as suggested by researchers in Japan and it can to be performed under local anesthesia, in future most of the benign lesions could be excised through ductoscopy in the outpatient basis.

Current ductoscopy systems and endoscopic biopsy:

Mammary ductoscopy has improved on last 13 years. Rigid endoscopes were developed after initial blind intraductal biopsy experience. Earlier techniques were constrained by limited optics, large caliber scopes and few working channels for insufflation and biopsy. In 1988, Teboul used 1.7 mms rigid ductoscope along with ultrasonography to view ductal cavities. In contrast to previous rigid ductoscopes, today's newer technology has given us opportunity to use small diameter ranging from 0.7 to 1.2 mm microendoscopes that magnifies structures upto 60 times normal size with high quality images. A microendoscope gives us clear, large, and sharp images of the ductal system and gives sufficient working channels for insufflation, cell

extraction for diagnosis and possible therapeutic intervention. The video monitor is connected with fiber-optic core which is placed within the sheath with the magnification of 60x. With the help of expression of nipple fluid, massage, gentle pressure and warming, the duct orifices were identified. The probe is used to dilate the duct orifice, then with the aid of metal lumen expander, metal introducer is inserted with in situ obturator. When reached inside the duct, the introducer was left inside for passage of endoscope and the obturator and lumen were removed. For standard surgical procedure, mammary ductoscopy is performed with general anesthesia, however it can also be performed under intravenous sedation in addition to local anesthesia. In addition, Mammary ductoscopy can be easily done in office or outpatient basis with local anesthesia by topical gel or by periareolar infiltration. Wires, Color dye, or clips may be used as a marker to identify lesions for accurate pathological diagnosis.

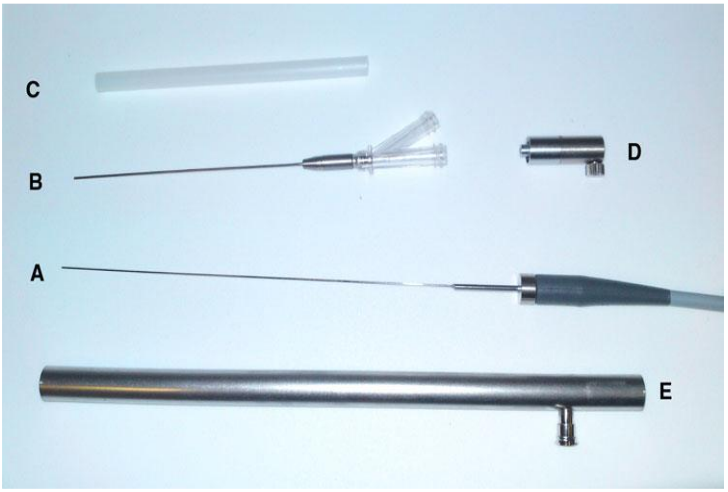

Figure 1: A =fiberoptic scope, B= two-port cannula, C= cannula sheath, D= shifter, E= protective metal sheath for the fiberoptic scope

Intraductal breast biopsy (IDBB) examination via ductoscopic observation has been used for the diagnosis of a nipple discharge due to intraductal lesions. IDBB examination is a new tool not only for the diagnosis but it also helps in treating benign lesions. Matsunaga et al. [34] states that mostly papillomas present in major ducts whereas cancinoma were separately in a peripheral duct. Denewer et al. [27] found that ductoscopic distance traveled was specifically related to histopathology. There was no any malignant lesion within a depth of 2 cms. Deeper lesions may be missed with conventional major duct excision [8, 35]. In the patients with Pathological nipple discharge, 20% lesions deeper than 3cms were detected by galactograph whereas ductoscopically detected lesions deeper than 4 cm were 18% . IDBB has important role in treating DCIS and pre-invasive atypia with administration of intraductal medications. Pre and post treatment biopsies can be assessed with the help of IDBB for treatment efficacy.

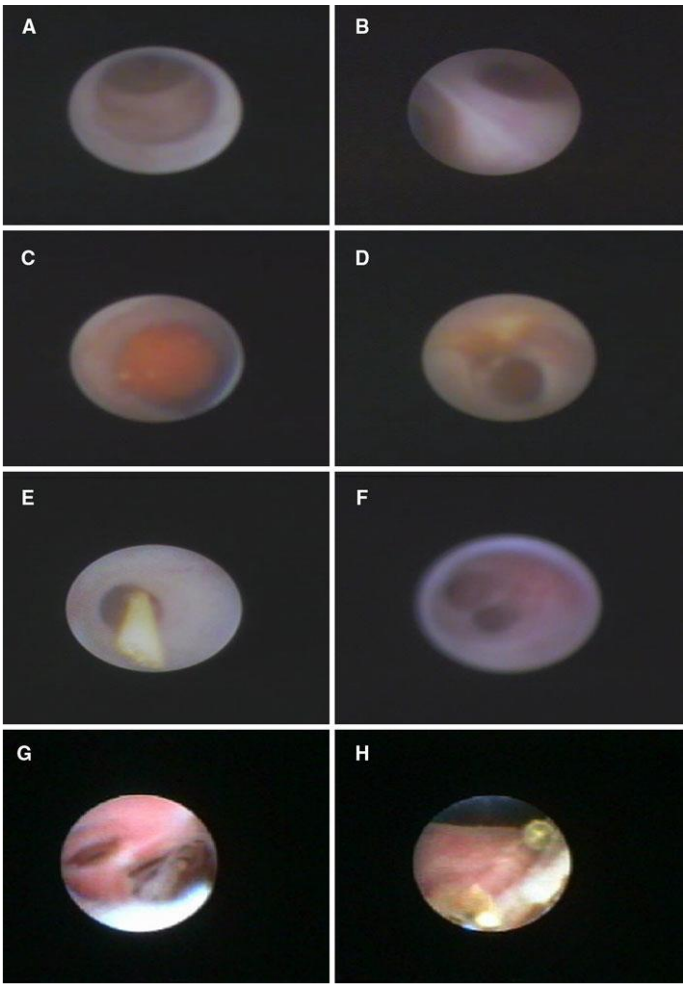

Figure 2: Ductoscopy Images: A= Normal duct= Branching ducts, C= Large papilloma, D= Flat papilloma, E= Calcified lesion in the duct, F = Ductal carcinoma in situ, G= DCIS and invasive disease branching ducts; with normal epithelium, H= Positive tumor margin, with surgical cavity from recent excision

Limitations and complications:

Complications from mammary ductoscopy are uncommon and it includes pain, infections and inflammation. Every surgical procedure has its own limitations and mammary ductoscopy also have its limitations. Breast ductal system is different from other ductal system. Like in salivary gland system, there is presence of single duct orifice but the breast ductal system has multiple tiny orifices on the nipple surface. Breast duct orifices vary greatly from its anatomy. Most studies showed duct endoscopy can visualize only one or two ducts per breast, so ductoscopy can miss a significant number of other ducts. Due to short length (6-8cm), access to peripheral lesions may be limited. Sometimes mammary ductoscopy can not be applicable due to lumen occlusion in the patients with scarring and sclerosis. The angulation and narrowing of ductal branches may cause duct perforation but there is no long lasting effects on the breast, however this may cause mild postprocedure discomfort.

Ductoscopic management of PND:

Mammary ductoscopy is performed by using microedoscope (0.1-0.2 mm in diameter) with direct visualization of the lesion with the help of specific instrument, that is connected to a source of light. Tumors with 0.1mm in diameter can be visualized by ductoscope at a distance from 10 cms.

With the use of ductoscope irrigation lavage can be done to identify the origin of discharge. In this process, ductal lavage catheter was catheterized and 5-10cc of normal saline was injected and then the liquid was aspirated for cytology. Then the endoscope ranging from 1.1 to 0.5mm in external diameter is introduced with the working channel of 0.35 to 0.45 mms that provides depth of perception of visualization. The findings from this method may be Papillomas, intra-ductal scars adhesions, duct obliteration, intraductal calcification, epithelial surface anomalies and obstructing endoluminal lesions.

However there is low likelihood of malignancy, the excision of duct is recommended to patients with pathological nipple discharge based on the inadequate sensitivity of diagnostic modalities. Sabel et al. describe that, the selected patients of nipple discharge with normal physical exam and diagnostic imaging and who do not desire duct excision, needs short-term observation and repeat evaluation. Balci et al.[19] performed ductoscopy with the patient of intraductal papilloma. Papilloma excision with ductoscope was successfully done in the patient of PND without recurrence of discharge or developed malignancy over 5 years of follow-up. So, the papilloma can be safely extracted with ductoscope which provides rapidly disappearing of PND.

Matsunaga et al. [10] successfully performed mammary ductoscopy for 315 patients with a pathologic nipple discharge. In 47 cases of carcinoma, 38 (81%) was seen at ductoscopy. In 119 cases of papilloma, 115 (96.6%) was successfully identified by ductoscopy. Denewer et al. [2], performed ductoscopy for 54 patients. There were 41 cases of breast lesions(76%). 11 cases of intraductal thickening, five cases of hyperplasia, two cases of papilloma, two cases of ADH, one case of DCIS, and one case of invasive cancer were seen at ductoscopy. Hence mammary ductoscopy evolved now as a diagnostic as well as therapeutic tool for the patients with pathologic nipple discharge.

Breast conservation surgery:

MD is useful in breast conservation surgery for malignant disease, both for invasive cancer and for in situ carcinoma. The main aim of breast conservation surgery is to achieve a better cosmetic outcome with the clear margins. Adjuvant radiotherapy along with breast-conserving treatment gives significant survival benefit where breast cancers are completely excised. There are new strategies to maintain adequate margins which include ultrasound marking, needle localization, use of frozen sections, and re-excision of margins if necessary. With the help of ductoscope, the surgeons can identify the boundaries of the lesions while excising DCIS. Excision with the guidance of ductoscope helps in unnecessary removal of large volume of tissue which happens in surgical approaches such as terminal duct excision, and it also helps in minimizing cosmetic deformity and for young women it may make breast feeding possible. Ductoscopy can identify the accurate site of lesion. Dye of Methylene blue can be injected through the endoscope to mark the target duct for surgical excision. According to Dooley et al.[40] Mammary ductoscopy successfully done in 150 out of 201 patients

(74.6%) and additional lesions founded outside the planned excision site in 83 cases (41%). So they concluded that mammary ductoscopy can identify more diseases than conventional methods like mammography and ultrasound and it also improves the potential positive margin rate from 23.5 to 5%.

CONCLUSIONS

Breast ductoscopy is a novel and so far the only visual intraductal approach to directly identify breast duct lesions. The upgrading of micro-instruments such as higher resolution cameras, biopsy tools, and radiofrequency ablators allows for accurate diagnosis and treatment ductoscopically. Ductoscopy is good alternative to conventional ductography in detecting breast diseases and in guiding surgery of breast for pathologic nipple discharge. The role of mammary ductoscopy has evolved from newer techniques to overcome limitations imposed by older techniques. Ductoscopy plays a vital role in screening patient groups with pathological nipple discharge of moderate to high breast cancer risk, as determined from family history or a breast cancer predisposition gene mutation. The intraductal biopsy taken by ductoscope and newer developments of autofluorescence techniques gives us accurate diagnosis with pathological nipple discharge. Therapeutic ductoscopy and autofluorescence ductoscopy will able to eliminate unnecessary biopsies of intraductal lesions. New and novel technical innovations are under development which could have remarkable impact on diagnostics and therapeutic options of breast endoscopy in the future. There is a significant role of mammary ductoscopy in treating the patient of pathologic nipple discharge as it facilitates targeted surgical excision, avoides unnecessary surgery, and limiting the extent of surgical resection for benign disease. Breast conservation surgery with the guidance of ductoscopy has higher benefits for cancer patients, specifically in reducing re-excision rates for positive margins. Mammary ductoscopy has potential to detect early breast cancer and can be performed safely in office, Hence, mammary ductoscopy should be considered in all the patients with pathological nipple discharge.

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