Learning objectives

To illustrate the spectrum of ultrasonographic findings in our series of patients with nipple discharge.
Background

Nipple discharge is a common symptomatic problem that causes many women discomfort and anxiety. It represents the third most common breast complaint for which women seek medical attention, after lumps and breast pain.

It is classified as normal or abnormal based on its features: presentation, color and consistency.

*Types and causes of nipple discharge*

Nipple discharge can be unilateral or bilateral; it may occur from single or multiple ducts, spontaneously or only in response to breast manipulation. Depending on its color, the nipple discharge can be serous, mucinous, milky, purulent, serosanguineous or sanguineous; it may be thick or clear based on its consistency.

Nipple discharge can be related to benign conditions, such as duct ectasia, fibrocystic changes, intraductal papilloma or galactorrhea; or to malignant conditions such as ductal, lobular or papillary carcinoma. [1]

Galactorrhea appears either as physiologic discharge - non-spontaneous, associated with pregnancy and breastfeeding or induced by manipulation, or non-physiologic - usually spontaneous, secondary to trauma, endocrine abnormalities, or medications. Thus, galactorrhea is more likely to be of benign origin, usually bilateral either spontaneous or stimulated. [2]

Fibrocystic changes, duct ectasia, plasma cell mastitis and periductal mastitis are benign causes of nipple discharge that is more often generated bilateral, on expression only, from multiple ducts. Women with fibrocystic breasts may experience clear, serous or mucinous discharge. Discharge that contains pus may indicate an infection.

Nipple discharge is of concern if non-lactational, bloody, serosanguinous or serous, watery (clear), spontaneous, persistent and unilateral - emanating from one duct orifice.

Of the benign conditions that cause suspicious nipple discharge, approximately half is due to papilloma and the other half is a mixture of benign fibrocystic conditions or duct ectasia.

All types of breast carcinoma (e.g., ductal, lobular, tubular and medullar) are sometimes diagnosed as a result of the nipple discharge symptom. The papillary carcinoma, despite it is a rare malignancy (< 1%), usually arise inside a duct and may present initially as a unilateral nipple discharge that originates in one duct. [1]
Imaging modalities in nipple discharge

The standard diagnosis modalities for nipple discharge evaluation are the history, physical examination and imaging methods - including mammography, ultrasonography, galactography and MRI.

Routine mammography is usually normal in patients with nipple discharge caused by benign conditions. Benign conditions may cause the following mammographic findings: distended retroareolar ducts, nodules, periductal calcifications and nipple retraction. All of these mammographic findings are non-specific and therefore usually are not helpful in determining the exact cause of discharge. When the cause of discharge is malignant, the mammogram is more likely to be abnormal, but is still negative about half of the time. A few patients with nipple discharge and abnormal mammograms may show classic findings of malignancy, but most, like patients with benign etiologies for discharge, have nonspecific findings. [3]

Galactography is useful in the evaluation of spontaneous discharge from the nipple of a nonlactating breast. Ductography can only be performed if the nipple discharge is reproducible on physical examination and if the duct can be cannulated. [4] Tabar et al. recommended that all patients with a spontaneous bloody or serous discharge from a single lactiferous orifice undergo galactography in addition to physical, cytological and mammographic examination. [5]

The important advantage of this technique is that it gives the exact topography and the depth of the lesion, guiding the excision and increasing the probability of surgical removing (with no preoperative galactographic localization, a more distal lesion may be left in the breast with central duct excision). [2]

In abnormal nipple discharge, galactography can detect ductal dilatations, filling defects (representing benign or malignant masses or inspissated ductal material), ductal wall irregularity (suggesting ductal carcinoma in situ) or the cut-off sign (completed obstructed duct by an endoluminal mass).

Ultrasonography is the modality of choice for the assessment of central lesions, replacing galactography in most of the cases. The combination of grayscale ultrasound with color or power Doppler evaluation enable the depiction of a substantial proportion of the papillomas - the main cause of nipple discharge. Ultrasonography can be used for primary diagnosis of an intraductal papillary lesion and for its preoperative localization. In finding of peripheral small papillomas ultrasound is less sensitive, especially when ducts are not dilated.

Sonography can demonstrate other causes of nipple discharge, including communicating cysts and duct ectasia. In women with sanguineous discharge, ultrasonography
can detect an invasive carcinoma, or is a complementary tool, characterizing a mammographic mass.

Magnetic resonance imaging (MRI) may show the intraductal location of a mass (T2WI), and after contrast medium injection, may reveal some lesions when conventional methods were unsuccessful. \[2\]
Imaging findings OR Procedure details

Results

Between 2006 and 2010, a number of 8439 patients were evaluated in the Breast Department, from the Clinic of Radiology - Cluj-Napoca.

We included in our study a total of 135 women (1.6 %), who have had a nipple discharge in their recent history or at presentation. The patients who were not evaluated by ultrasonography as well as those who didn’t undergo a proper assessment, were excluded from this study.

The mean age of the included patients was 44.6 years (with a standard deviation of 12.68); 63.7 % (86 patients) had an age of 40 years or more.

We divided our group of patients into two categories, based on the nipple discharge features: those with "worrisome" (serous, serosangvineous or sangvineous, spontaneous, persistent and unilateral discharge - emanating from one duct orifice) and those with "not-worrisome" discharge.

36 patients (26.7 %) were therefore included in the first group, having a "worrisome" nipple discharge. 55 % of the "worrisome" nipple discharge was sangvineous and unilateral.

From the initial group of 135 patients, 40 % (54) have had a histologically examination for their nipple discharge.

The "worrisome" discharge was due to papilloma in 33,3 % of cases, carcinoma (22,3 %), ductal ectasia along with fibrocystic changes and ductal hyperplasia in 44,4 %.

Illustrative section

We present some examples of the ultrasonographic features of the entities most common responsible for nipple discharge, some of them having the histopathological correspondent.

Ductal hyperplasia and atypical ductal hyperplasia

Ductal hyperplasia +/- atypia are frequent findings after duct excision. The distinction between florid usual ductal hyperplasia - which results in papillary excrescences from the duct walls, and true papillomas is that true papillomas have
a fibrovascular stalk through they receive their blood supply, whereas papillary ductal hyperpasia generally does not.\[^{2, 3}\]

Therefore, proliferation may resemble papillary structures, but with no fibrovascular core. Fig. 1-4
Fig.: Case 1: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Doppler-ultrasonography shows no vascular signal inside this cystic lesion.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 1: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Histopathology: Typical ductal hyperplasia with solid and cribriform pattern - Haematoxylin and Eosin, original magnification X100.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 2 (FF) Histopathology of typical ductal hyperplasia with micropapillary pattern in a 61-year-old woman with multiductal, serous discharge from the right nipple - Haematoxylin and Eosin, original magnification X40.

**References:** Radiology, Fundeni - Cluj-Napoca/RO

Atypical ductal hyperplasia may arise within the epithelium lining the surface of papillomas or from preexisting papillary usual duct hyperplasia. [3] Atypical ductal hyperplasia are high-risk lesions for developing a subsequent neoplasia.

**Duct ectasia**

Duct ectasia is responsible for 17-36 % of pathologic nipple discharge cases [2], which is often bilateral, or multiductal, though more often is asymptomatic and discovered incidentally at the time of screening mammography. [6]

The histologic appearance varies greatly with the stage of development, accounting for the multiple different histologic terms used to describe this condition. Duct ectasia describe the early and often asymptomatic phase of this condition. [3] Fig. 5-9
**Fig.:** Case 3: (CE) A 51-year-old woman with greenish multiductal, bilateral discharge. Right breast mammography, cranio-caudal view, showing tubular radiopaque retroareolar structures.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
**Fig.** Case 3: (CE) A 51-year-old woman with greenish multiductal, bilateral discharge. Left breast mammography, cranio-caudal view, showing tubular radiopaque retroareolar structures.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 3: (CE) A 51-year-old woman with greenish multiductal, bilateral discharge. Ultrasonography revealed dilatated retroareolar ducts in the right breast, containing anechoic fluid.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 3: (CE) A 51-year-old woman with greenish multiductal, bilateral discharge. Ultrasonography revealed dilated retroareolar ducts in the left breast, containing anechoic fluid.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.** Case 4 (AS): Histopathology image of dilatated ducts in a patient (47 years old) with multiductal serous discharge from the right nipple - Haematoxylin and Eosin, original magnification X100.

**References:** Radiology, Fundeni - Cluj-Napoca/RO

Comedomastitis have been used to describe the thick, pasty or cheesy secretions that accumulate within the lumen of the dilated ducts in chronic duct ectasia. Periductal mastitis describes the phase in which duct rupture and release of duct contents into surrounding tissues leads to an acute inflammatory reaction around the duct composed primarily of lymphocytes, plasma cells and macrophages. Plasma cell mastitis is merely a variant of periductal mastitis in which periductal plasma cells rather than lymphocytes predominate. [3] Fig. 10-16
Fig.: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Right breast mammogram, cranio-caudal view: multiple regular, rodlike calcifications, distributed in a linear pattern

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Left breast mammogram, cranio-caudal view: multiple regular, rodlike calcifications, distributed in a linear pattern

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Ultrasonography: dilated ducts with intraductal calcifications. 

References: Radiology, Fundeni - Cluj-Napoca/RO
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References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated duct - Haematoxylin and Eosin (original magnifications X40)

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated ducts with periductal chronic inflammation - Haematoxylin and Eosin (original magnifications X40)

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.** Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated ducts with intraductal microcalcifications - Haematoxylin and Eosin (original magnifications X100)

**References:** Radiology, Fundeni - Cluj-Napoca/RO

Mastitis obliterans refers to fibrous obliteration of the duct lumen, that represents the end stage of this disease. The fibrous obliteration can be homogenous or occur in a garland pattern with a central nodule of fibrosis surrounded by multiple small lumina.\(^3\) Fig. 17, 18.
Fig.: Case 6: (NA) A 49-year-old woman with dark green multiductal discharge from the right nipple. Ultrasound showing a pseudonodular, hypoechoic lesion, with architectural distorsion and a dilatated duct in proximity.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 6: (NA) A 49-year-old woman with dark green multiductal discharge from the right nipple. Ultrasound showing a pseudonodular, hypoechoic lesion, with architectural distortion and a dilated duct in proximity.

References: Radiology, Fundeni - Cluj-Napoca/RO

Fibrocystic changes

Fibrocystic change can cause secretions by various different mechanisms. In most cases, secretions probably originate peripherally within secreting and cystically dilated terminal ductolobular units, that contain apocrine metaplastic changes. Compression of the communicating cyst may express projectile secretions from the nipple (a "trigger point"). The ducts between the secreting cyst and the nipple are not always dilated. [3] Fig. 19-21
**Fig.** Case 7: (BN) - A 32-year-old woman with yellow uniductal discharge from her right nipple. Ultrasound scan - macronodular lesion in the right-upper quadrant of the right breast, having variable echogenicity, with solid and cystic areas; note the hyperechoic spots with acoustic shadowing due to microcalcifications.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 8: (BL) - A 45-year-old woman with greenish multilobular discharge from the right nipple. Ultrasonography revealed a mixture of dilated ducts and cystic areas in the right breast.

**References**: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 8: (BL) - A 45-year-old woman with greenish multiductal discharge from the right nipple. Ultrasonography revealed a mixture of dilatated ducts and cystic areas in the right breast.

References: Radiology, Fundeni - Cluj-Napoca/RO

**Papillomas**

Intraductal papillomas are ductal epithelial proliferations that grow in an arborescent, frondlike pattern; they usually have central fibrovascular stalk and are covered by the normal double layer of epithelium and myoepithelium. [3]

In case of an intraductal papillomas, the nipple discharge is usually from a single duct orifice, being either serous or blood-stained. [6]

Papillomas can be divided into central and peripheral varieties.

Large duct papillomas arise in the subareolar region, in or near the lactiferous sinuses. They are usually single and occur most commonly in the perimenopausal period. [3] - Fig. 22, 23
Fig.: Case 9: (HM) A 71-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasound scans showing a dilatated central duct with a solid proliferation.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 9: (HM ) A 71-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasound scans showing a dilatated central duct with a solid, vascular proliferation. (Histopathology - intraductal papilloma)

**References:** Radiology, Fundeni - Cluj-Napoca/RO

Peripheral papillomas that arise within the terminal duct of the terminal ductolobular unit are more often multiple; tend to occur in younger patients and are frequently associated with diffuse epithelial proliferation of varying degrees in the affected and surrounding terminal ductolobular units, including atypical ductal hyperplasia and ductal carcinoma in situ, likely explaining the higher premalignant potential of peripheral papillomas. Peripheral papillomas are less frequently a cause of nipple discharge (only about 20% of the time). [3] - Fig. 24 - 27

![Ultrasonography](image)

Fig.: Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilatated central duct with anechoic content.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilatated duct with anechoic content in its central part, having a solid proliferation inside, in its deep segment.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilatated duct with anechoic content in its central part, having a solid, vascular proliferation inside, in its deep segment.

**References**: Radiology, Fundeni - Cluj-Napoca/RO

The term papillomatosis has been used to describe multiple peripheral papillomas. Papillomatosis really represents a form of florid (papillary) usual duct hyperplasia. [3]

Mammographic findings in papillomas include a retroareolar mass or multiple, well-circumscribed peripheral masses, nodular proeminent ducts or clustered calcifications. [2]

On ultrasound imaging, papillomas have been described to have three basic patterns - an intraductal mass with or without ductal dilatation - Fig. 28, 29 - an intracystic mass - Fig. 30, 31, or a predominantly solid mass if the lesion completely fills the duct. [7] - Fig. 32, 33.

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**Fig.**: Case 11: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Ultrasound images with dilatated duct close to the nipple, having an intraluminal solid proliferation.

**References**: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 11: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Ultrasound images with dilatated duct close to the nipple, having an intralumenal solid proliferation with a vascular core - intraductal papilloma.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 12 : (TM) A 40-year-old woman with brown uniductal discharge from the right nipple. Ultrasound: Solid intracystic proliferation on the back wall.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 12: (TM) A 40-year-old woman with brown uniductal discharge from the right nipple. Ultrasound: Solid intracystic proliferation on the back wall with a vascular core. (Histology revealed an intracystic papilloma)

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 13: (PL) A 44-year-old woman with serous uniductal discharge from the left nipple. Ultrasound: Dilatated central duct with a solid content.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 13: (PL) A 44-year-old woman with serous uniductal discharge from the left nipple. Ultrasound: Dilated central duct with a solid content and internal vascular signal on power Doppler - intraductal papilloma.

**References:** Radiology, Fundeni - Cluj-Napoca/RO

A vascular pedicle may be visible on Doppler imaging, which along with the lack of compressibility, can help differentiate the papilloma from intraluminal debris.\(^6\) - Fig. 34, 35 and Fig. 36, 37.

**Fig.**: Case 14: (DG) A 38-year-old woman with sangvinous uniductal discharge from her right nipple. Ultrasonography showed a solid isoechoic proliferation in a dilated duct.

**References:** Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 14: (DG) A 38-year-old woman with sangvinous uniductal discharge from her right nipple. Ultrasonography showed a solid isoechoic proliferation in a dilated duct, with color Doppler signal inside. Histopathology revealed a fibrocystic area with an intracystic papilloma.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 15: (SE) A 40-years-old woman with serous uniductal discharge from the right nipple. Ultrasound Solid intracystic proliferation.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 15: (SE) A 40-years-old woman with serous uniductal discharge from the right nipple. Ultrasound Solid intracystic proliferation with an internal vascular pedicle visible on Doppler imaging. (Histology revealed an intracystic papilloma)

**References:** Radiology, Fundeni - Cluj-Napoca/RO

**Carcinoma**

Most carcinoma arise peripherally within the terminal ductolobular unit. By the time there are symptoms, however, malignancy has typically involved multiple lobules and often has also spread centrally within the lobar ductal system for variable distances. A smaller percentage of carcinomas arise in the central ducts, near the nipple, in locations similar to the sites of origins of central papillomas[^3] - Fig. 38, 39.
Fig.: Case 16: (ME) A 46-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasonography showing dilatated central duct with a solid content.

References: Radiology, Fundeni - Cluj-Napoca/RO
and internal vascular pattern. (Histopathology revealed the presence of an intraductal carcinoma)

References: Radiology, Fundeni - Cluj-Napoca/RO

Some of these malignant lesions arise in preexisting papillary duct hyperplasia, and a few may actually arise from the epithelium of preexisting large duct papillomas. These centrally arising carcinomas are relatively uncommon, but are far more likely to cause nipple discharge than are the more common, peripherally arising carcinomas. The discharge caused by these central malignancies is more likely to be bloody than the discharge associated with benign lesions. [3]

The most common malignancy associated with nipple discharge is ductal carcinoma in situ (DCIS), most frequent the micropapillary subtype, with papillary DCIS (intraductal papillary carcinoma) also reported in association. - Fig. 40-42.

Fig.: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images of dilatated central ducts with intraluminal solid proliferations.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images of dilatated central ducts with intralumenal solid proliferations.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology- tumoral cell proliferation with fibrovascular core - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X2. 

References: Radiology, Fundeni - Cluj-Napoca/RO

Invasive carcinoma rarely presents with nipple discharge, with papillary types being the exception[^6] - Fig. 43-46.
Fig.: Case 18: (CR) - A 52-year-old woman with serous uniductal discharge from the right nipple. Ultrasonography showing two dilatated ducts located close to the nipple, with intraluminal, non-compressible, solid lesions.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 18: (CR) - A 52-year-old woman with serous uniductal discharge from the right nipple. Ultrasonography showing two dilated ducts located close to the nipple, with intraluminal, non-compressible, solid lesions, having a vascular pattern inside. Histology revealed a bifocal invasive intraductal carcinoma.

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References: Radiology, Fundeni - Cluj-Napoca/RO

Malignant papillary lesions cannot be reliably differentiated from intraductal papillomas on imaging appearances alone, and therefore core biopsy or surgical excision is required. The management of core biopsy diagnosed intraductal papillomas remains contentious. Imaging follow-up alone or surgical excision are actually the management strategies accepted for papillary lesions.

Discussions

Ultrasonography is the optimal imaging modality for the assessment of central lesions, replacing galactography in most of the cases. The sensitivity of ultrasonography in identification the source of nipple discharge was related to be 93 %, versus 68 % for galactography, in one series. [2]

Demonstrating subareolar ducts requires radial scan planes that lie parallel to the long and short axes of the ducts, but with slight adjustments in order to scan ducts perfectly parallel to their long axes. If the ducts are tortuous or branching changing patient position or breast compression can straighten ducts that are too tortuous to evaluate. A
lesion must be demonstrated in two orthogonal planes parallel (radial) and perpendicular (antiradial) to the long axis of the duct of origin. [3]

Though, sometimes ultrasonography may not be able to identify all the lesions responsible for nipple discharge; like in the case of multiple, central - but more frequently peripheral papillary lesions. In this situation, galactography or MRI may provide a correct assessment of these lesions, allowing a proper therapeutic approach. - Fig. 47-52

Fig.: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images with dilatated central ducts with internal solid proliferation.

References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images with dilatated central ducts with internal solid proliferation.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.**: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Galactography reveals multiple contrast-agent filling defects with parietal irregularities and the cut-off sign.

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References: Radiology, Fundeni - Cluj-Napoca/RO
Fig.: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X4.

References: Radiology, Fundeni - Cluj-Napoca/RO
**Fig.** Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X20.

**References:** Radiology, Fundeni - Cluj-Napoca/RO

Sonographic study can be falsely positive for intraductal papillary lesions when the duct is tortuous or curved. Sometimes, the dividing wall at a branch point in the duct will be mistaken for an intraductal lesion. False-positive studies can also result from intraductal and periductal fibrosis or from adherent clots within the lumen. [3]

Ultrasound may be falsely negative when the duct containing the papillary lesion is not fluid filled, nor dilated. Sonography also becomes less effective the more peripherally a papiloma occurs. The peripheral ducts are smaller, far more numerous, and deeper, and they course at less optimal angles of incidence to the ultrasound beam. They are less likely to be dilated. Additionally, the area of the breast that must be scanned is much larger if the peripheral ducts are to be evaluated. [3]

The secretions or blood associated with intraductal solid lesions may be isoechoic with and may obscure the underlying lesion and in this case the compression technique can
be useful. Papillomas, although relatively soft compared to other solid nodules, are still firm enough to prevent complete collapse of the duct segment containing the lesion.

Nevertheless, using an adequate technique of investigation - including a proper compression with the transducer - but without compression on the blood vessels in the Doppler technique, a correct Doppler calibration as well as a carefully examination of the deeper areas of the breast - we can depict most of the lesions responsible for nipple discharge.

Real-time tissue elastography may provide additional characterization of breast lesions, improving specificity, particularly for low-suspicion lesions. [8]

The use of coded harmonics was founded to be an improvement in breast imaging. It helps distinguish artifactual internal echoes within cysts from true internal echoes and reduces reverberation echoes from breast cysts. Harmonics may increase the echogenicity of complex cystic lesions, accentuating true internal echoes.

Finally we recommend an algorithm (used in our Department) for routine evaluation of women with nipple discharge.
Fig.: Algorithm in evaluating woman with nipple discharge

References: Radiology, Fundeni - Cluj-Napoca/RO
Images for this section:

Fig. 0: Case 1: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Ultrasonography shows a cystic lesion within the right upper internal quadrant, having some small internal hypoechoic proliferations.

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Fig. 0: Case 1: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Doppler-ultrasonography shows no vascular signal inside this cystic lesion.

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Fig. 0: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Right breast mammogram, cranio-caudal view: multiple regular, rodlike calcifications, distributed in a linear pattern

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**Fig. 0:** Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated duct - Haematoxylin and Eosin (original magnifications X40)

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Fig. 0: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated ducts with periductal cronic inflammation - Haematoxylin and Eosin (original magnifications X40)

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Fig. 0: Case 5: (KC) A 60-year-old woman with serous multiductal, bilateral discharge. Histopathology: Dilatated ducts with intraductal microcalcifications - Haematoxylin and Eosin (original magnifications X100)

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**Fig. 0:** Case 6: (NA) A 49-year-old woman with dark green multiductal discharge from the right nipple. Ultrasound showing a pseudonodular, hypoechoic lesion, with architectural distortion and a dilatated duct in proximity.

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Fig. 0: Case 6: (NA) A 49-year-old woman with dark green multiductal discharge from the right nipple. Ultrasound showing a pseudonodular, hypoechoic lesion, with architectural distortion and a dilatated duct in proximity.

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Fig. 0: Case 7: (BN) - A 32-year-old woman with yellow uniductal discharge from her right nipple. Ultrasound scan - macronodular lesion in the right-upper quadrant of the right breast, having variable echogenicity, with solid and cystic areas; note the hyperechoic spots with acoustic shadowing due to microcalcifications.

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Fig. 0: Case 8: (BL) - A 45-year-old woman with greenish multiductal discharge from the right nipple. Ultrasonography revealed a mixture of dilatated ducts and cystic areas in the right breast.

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**Fig. 0:** Case 8: (BL) - A 45-year-old woman with greenish multiductal discharge from the right nipple. Ultrasonography revealed a mixture of dilatated ducts and cystic areas in the right breast.

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**Fig. 0:** Case 9: (HM) A 71-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasound scans showing a dilated central duct with a solid proliferation.

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**Fig. 0:** Case 9: (HM) A 71-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasound scans showing a dilatated central duct with a solid, vascular proliferation. (Histopathology - intraductal papilloma)

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**Fig. 0:** Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilatated central duct with anechoic content.

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Fig. 0: Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilated duct with anechoic content in its central part, having a solid proliferation inside, in its deep segment.

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Fig. 0: Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Ultrasonography revealed a dilatated duct with anechoic content in its central part, having a solid, vascular proliferation inside, in its deep segment.

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**Fig. 0:** Case 10: (G-P E) A 57-year-old woman with sangvinous uniductal discharge from the right nipple. Histopathology: Intraductal papilloma - Haematoxylin and Eosin, original magnification X40.

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Fig. 0: Case 11: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Ultrasound images with dilatated duct close to the nipple, having an intralumenal solid proliferation.

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Fig. 0: Case 11: (IS) A 45-year-old woman with serous uniductal discharge from the right nipple. Ultrasound images with dilatated duct close to the nipple, having an intralumenal solid proliferation with a vascular core - intraductal papilloma.

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Fig. 0: Case 12: (TM) A 40-year-old woman with brown uniductal discharge from the right nipple. Ultrasound: Solid intracystic proliferation on the back wall.

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Fig. 0: Case 12 : (TM) A 40-year-old woman with brown uniductal discharge from the right nipple. Ultrasound: Solid intracystic proliferation on the back wall with a vascular core. (Histology revealed an intracystic papilloma)

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**Fig. 0:** Case 13: (PL) A 44-year-old woman with serous uniductal discharge from the left nipple. Ultrasound: Dilated central duct with a solid content.

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Fig. 0: Case 13: (PL) A 44-year-old woman with serous uniductal discharge from the left nipple. Ultrasound: Dilated central duct with a solid content and internal vascular signal on power Doppler - intraductal papilloma.

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Fig. 0: Case 14: (DG) A 38-year-old woman with sangvinous uniductal discharge from her right nipple. Ultrasonography showed a solid isoechoic proliferation in a dilated duct.

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**Fig. 0:** Case 14: (DG) A 38-year-old woman with sangvinous uniductal discharge from her right nipple. Ultrasonography showed a solid isoechoic proliferation in a dilated duct, with color Doppler signal inside. Histopathology revealed a fibrocystic area with an intracystic papilloma.

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**Fig. 0:** Case 15: (SE) A 40-years-old woman with serous uniductal discharge from the right nipple. Ultrasound Solid intracystic proliferation.

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Fig. 0: Case 15: (SE) A 40-years-old woman with serous uniductal discharge from the right nipple. Ultrasound Solid intracystic proliferation with an internal vascular pedicle visible on Doppler imaging. (Histology revealed an intracystic papilloma)

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Fig. 0: Case 16: (ME) A 46-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasonography showing dilatated central duct with a solid content.

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Fig. 0: Case 16: (ME) A 46-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasonography showing a dilatated central duct with a solid content and internal vascular pattern. (Histopathology revealed the presence of an intraductal carcinoma)

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Fig. 0: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images of dilatated central ducts with intralumenal solid proliferations.

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Fig. 0: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images of dilatated central ducts with intralumenal solid proliferations.

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Fig. 0: Case 17: (MA) A 54-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology- tumoral cell proliferation with fibrovascular core - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X2.

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Fig. 0: Case 18: (CR) - A 52-year-old woman with serous uniductal discharge from the right nipple. Ultrasonography showing two dilatated ducts located close to the nipple, with intraluminal, non-compressible, solid lesions.

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**Fig. 0:** Case 18: (CR) - A 52-year-old woman with serous uniductal discharge from the right nipple. Ultrasonography showing two dilatated ducts located close to the nipple, with intraluminal, non-compressible, solid lesions, having a vascular pattern inside. Histology revealed a bifocal invasive intraductal carcinoma.

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**Fig. 0:** Case 18: (CR) - A 52-year-old woman with serous uniductal discharge from the right nipple Ultrasonography showing two dilated ducts located close to the nipple, with intraluminal, non-compressible, solid lesions, having a vascular pattern inside - Histology revealed a bifocal invasive intraductal carcinoma.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images with dilatated central ducts with internal solid proliferation.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Ultrasound images with dilatated central ducts with internal solid proliferation.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Galactography reveals multiple contrast-agent filling defects with parietal irregularities and the cut-off sign.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Galactography reveals multiple contrast-agent filling defects with parietal irregularities and the cut-off sign.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X4.

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Fig. 0: Case 19: (HM) A 63-year-old woman with sangvinous uniductal discharge from the left nipple. Histopathology - intraductal papillary carcinoma - Haematoxylin and Eosin, original magnification X20.

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Fig. 0: Algorithm in evaluating woman with nipple discharge

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Conclusion

The use of an adequate ultrasound technique in combination with a good knowledge of the imaging pathology can detect most of the lesions responsible for nipple discharge, enabling a proper therapeutic approach to be done.
References


