

# INTRAPAPILLARY DUCT DILATION: A NEW ULTRASONOGRAPHY SIGN

## Dilatação ductal intrapapilar: um novo sinal ultrassonográfico

Hélio Sebastião Amâncio de Camargo Júnior<sup>1\*</sup>, Sandra Regina Campos Teixeira<sup>2</sup>,  
Marcia Martos Amâncio de Camargo<sup>3</sup>, Juliana Azevedo<sup>3</sup>, Maurício de Souza Arruda<sup>3</sup>

### ABSTRACT

**Objective:** To evaluate a not yet described ultrasound finding, the dilation of the intra-papillary portion of the lactiferous duct in patients with or without abnormal nipple discharge. **Methods:** 24 patients with pathological nipple discharge and intrapapillary duct dilation and 1,255 asymptomatic patients (control group) were studied. **Results:** Just one asymptomatic patient had intrapapillary duct dilation. Among the symptomatic patients, 19 were biopsied: ten with exclusively percutaneous approach, six with exclusively surgical approach, and three with an initial percutaneous and then a surgical approach. There was one invasive carcinoma and two carcinomas in situ (15.8% of the biopsied patients). In 11 patients, a papilloma was found, three of them with atypia. In one patient, ultrasonography identified intrapapillary extension of microcalcifications, and another patient a changed duct diametrically opposite to the duct which had a trigger point. In these two patients, the examination changed the treatment strategy. In two other patients, an extra-papillary finding was identified only after the intrapapillary duct dilation has been encountered. **Conclusion:** The intrapapillary duct dilation is a new ultrasonography sign that adds sensitivity to the evaluation of the patient with pathological nipple discharge, besides helping to find the lesion and to guide the treatment. Further research is needed to determine its prevalence and its positive and negative predictive values for cancer, atypia and papilloma.

**KEYWORDS:** breast ultra-sonography; nipple discharge; mammary duct ectasia; papilloma; breast neoplasms.

### RESUMO

**Objetivo:** Avaliar um achado de ultrassonografia inédito (dilatação intrapapilar do duto lactífero) em pacientes portadoras de fluxo papilar patológico e em pacientes assintomáticas. **Métodos:** Foram estudadas 24 portadoras de fluxo papilar patológico e dilatação ductal intrapapilar e 1.255 pacientes assintomáticas (grupo controle). **Resultados:** Apenas uma paciente assintomática apresentou dilatação ductal intrapapilar. Entre as pacientes sintomáticas, 19 foram biopsiadas, 10 com abordagem exclusivamente percutânea, 6 com abordagem exclusivamente cirúrgica e 3 com abordagem inicialmente percutânea e depois cirúrgica. Houve um carcinoma invasor e dois carcinomas *in situ* (15,8% das pacientes biopsiadas). Em 11 pacientes foi encontrado papiloma, 3 deles com atipias. Em uma paciente a ultrassonografia identificou extensão intrapapilar de microcalcificações e em outra, um duto alterado diametralmente oposto ao duto com sinal do gatilho clínico. Nessas duas pacientes o exame mudou a estratégia de tratamento. Em duas pacientes, um achado extrapapilar só foi identificado após o encontro da dilatação ductal intrapapilar. **Conclusão:** A dilatação ductal intrapapilar é novo sinal ultrassonográfico que agrega sensibilidade à avaliação da paciente com fluxo papilar patológico, além de ajudar a encontrar a lesão e a orientar o tratamento. São necessárias pesquisas adicionais para determinar sua prevalência e seus valores preditivos positivo e negativo para câncer, atipias e papilomas.

**PALAVRAS-CHAVE:** ultrassonografia mamária; derrame papilar; papiloma; neoplasias da mama.

<sup>1</sup>Commission of Breast Imaging, Federação Brasileira das Associações de Ginecologia e Obstetrícia – Campinas (SP), Brazil.

<sup>2</sup>Universidade Estadual de Campinas – Campinas (SP), Brazil.

<sup>3</sup>CDE Diagnósticos por Imagem – Campinas (SP), Amparo (SP), Brazil.

\*Corresponding author: hsacamargo@gmail.com

Conflict of interests: nothing to declare.

Received on: 12/13/2017. Accepted on: 04/19/2018.

## INTRODUCTION

Nipple discharge is considered pathological when it is unilateral and has a watery or bloody appearance<sup>1</sup>. In addition to being an uncomfortable symptom, the presence of pathological nipple discharge brings the concern of significant breast disease, more commonly papilloma, but even carcinoma, in some cases<sup>2</sup>.

The propaedeutic methods available to investigate nipple discharge include oncotic cytology of the secretion, imaging techniques such as mammography, ductography, ultrasonography and magnetic resonance imaging (MRI) and even endoscopic techniques, like ductoscopy. However, all these methods have limited sensitivity, specificity and/or availability. Given these limitations, new concepts and features that may help the approach of the pathological nipple discharge patients are desirable, especially if they do not have additional costs or poor availability.

This article presents a finding unpublished up to now: the identification of a dilated fluid-filled intrapapillary portion of the lactiferous duct. This sign seems to be important in the diagnosis of the pathological nipple discharge, as a marker of a relevant duct disease as much as an assistance to find the diseased duct. This article describes this finding and preliminary results of its identification.

## METHODS

We identified for the first time in 2010 the intrapapillary duct dilation, in a patient with a dark-color unilateral nipple discharge, which gave ground for suspecting of the presence of red blood cells (Figure 1). The oncotic cytology found proliferative cells suggesting papilloma. The ultrasonography showed a dilated duct containing liquid inside the nipple. At that time, we did not know if this finding had any relation to the patient's clinical profile.



**Figure 1.** Dilation containing liquid from an intrapapillary segment of a lactation duct.

A long time has passed before we saw this finding again. In 2016, we identified the intrapapillary duct dilation in a patient with a frankly bloody unilateral nipple discharge. This second identification drew our attention to the potential diagnostic value of this finding. So, we began to look for it systematically in all patients with pathological nipple discharge. Until we completed the inclusion of cases for this article (March 2017), we found intrapapillary duct dilation in 24 patients. This specific group of patients was the object of this study.

The presence of other extra-papillary imaging alterations was studied by ultrasonography, mammography or MRI. When the biopsy was performed the biopsy method and the histopathological findings were also object of study.

Various types of ultrasonography devices were used, all of them with high-frequency linear transducers: Voluson 630, Voluson PRO and Logiq S8 (GE Healthcare, Chicago, Illinois, United States) and HDI 5000 (ATL, Bothell, Washington, United States).

As a control group, we systematically examined the papilla of 1,255 asymptomatic women on consecutive breast ultrasonography examinations over a period of 10 months.

## RESULTS

Among 1,255 patients who did not present nipple discharge (control group), just one had intrapapillary duct dilation, without any other finding.

Among the 24 patients with intrapapillary duct dilation, the ages ranged from 29 to 51 years old, with average of 54 and median of 51 years old.

Table 1 shows a summary of the extra-papillary and histopathological findings in patients with intrapapillary duct dilation, as well as the biopsy method used when the patient underwent biopsy.

Twenty-one patients had an extra-papillary associated finding, including nodule, duct ectasia with or without internal solid areas (Figures 2 and 3), duct thickening (Figure 4), or microcalcifications. In two patients, these extra-papillary findings were only detected after the identification of intrapapillary duct dilation. Only three patients had no other findings.

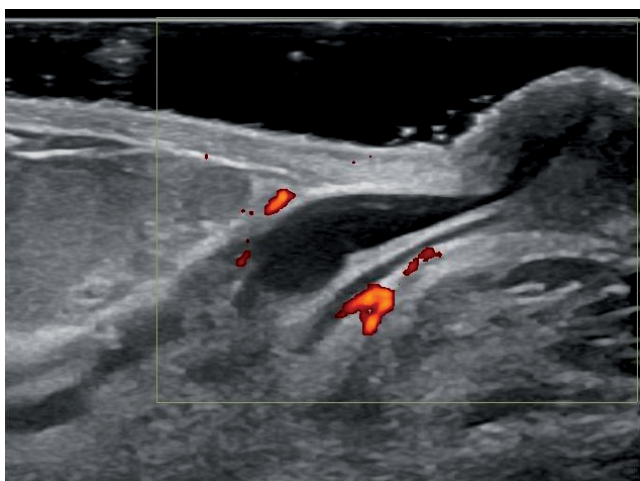
In one patient, there were two ducts with parietal thickening of diametrically opposite orientation. One of them was related to a trigger point, and the other one continued with the dilated duct segment within the papilla. We decided to recommend the excision of these two ducts, guided by the placement of two guidewires under ultrasonographic guidance (Figure 5), and the histopathological in this case showed epithelial proliferation in both specimens.

In one patient, intraductal calcifications were very apparent on ultrasonography which had also been seen on mammography. However, due to mammography compression, the microcalcifications appeared to be outside of the papilla, but the ultrasonography showed that they penetrated inside the papilla along with the lumen of the duct (Figure 6).

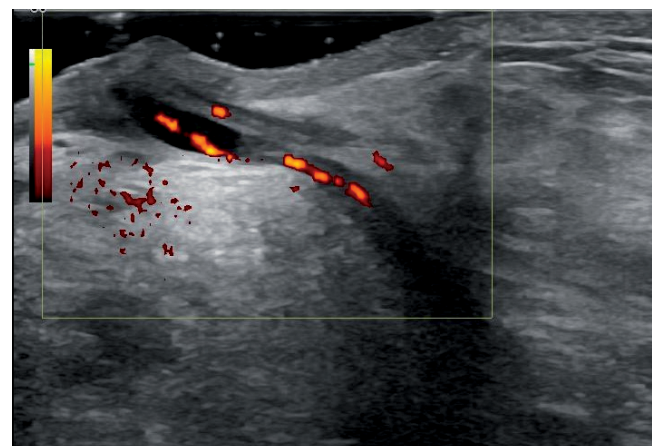
**Table 1.** Extra-papillary findings, histopathological results and biopsy method (when it is performed) in patients with intrapapillary duct dilation.

Patient	Age (years)	Result	Biopsy method	Additional image findings
1	44	Papilloma without atypia	Fine needle biopsy	Small solid lesion filling the duct
2	60	Ectasia, fibrosis	Mammotomy	Branched ducts with solid content
3	50	CDIS	Mammotomy	Thickened ducts and small nodules
4	36	No biopsy	No biopsy	Duct parietal thickening, healed with clinical treatment, characterizing galactoforitis
5	40	Papilloma with ADH	Mammotomy, after surgery	Branched complex lesion
6	29	Atypical papilloma	Biopsy of fragments, after surgery	Branched intraductal lesion
7	66	No biopsy	No biopsy	Prominent duct ectasia with internal echoes, probably representing solid content
8	43	Galactoforitis	Mammotomy	Extensive and branched intraductal lesion
9	48	No biopsy	No biopsy	Extensive intraductal lesion
10	48	Papilloma without atypia	Mammotomy	Intraductal solid lesion
11	44	Galactoforitis	Mammotomy	Discrete intraductal solid lesion
12	72	No biopsy	No biopsy	No other lesion
13	47	Papilloma without atypia	Surgery	Thickened duct with solid content
14	73	Papilloma without atypia	Mammotomy, after surgery	Solid intraductal content and nodule
15	73	Papilloma without atypia	Mammotomy, after surgery	Duct with solid content and nodules coming out of the duct
16	48	Invasive carcinoma	Fragment biopsy	Suspect lesion solid voluminous and microcalcifications
17	51	Papilloma without atypia	Mammotomy	No other lesion
18	58	No biopsy	No biopsy (recommended control)	No other lesion
19	61	Stromal fibrosis	Surgery	Duct with extensive vascularized solid area
20	62	Epithelial proliferation	Surgery	Thickened duct 12h; lesion 6h. Double needling.
21	51	Papilloma without atypia	Surgery	No other lesion.
22	63	Atypical papilloma	Surgery	Injuries type papiloform
23	55	Papilloma without atypia	Surgery	Small papillary and peripapillary intraductal lesion
24	85	High-degree CDIS	Mammotomy	Skinned edema, nipple retraction

CDIS: carcinoma ductal *in situ*; ADH: atypical duct hyperplasia.



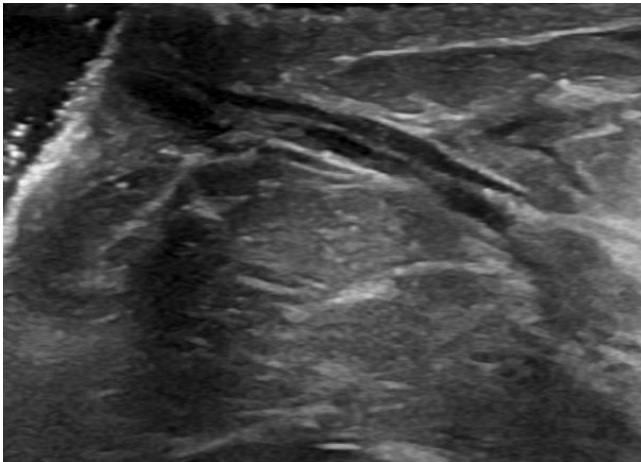
**Figure 2.** Intrapapillary duct dilation and solid intraductal lesion.



**Figure 3.** Another patient, with Doppler confirming the solid character of the intraductal content.

Five patients did not undergo biopsy. Three of them had no associated lesions and received a clinical recommendation of follow-up. In the other two patients, there were extra-papillary findings that led to biopsy recommendation, but the patients refused the biopsy.

Of the 19 patients who were submitted to biopsy, 13 initially underwent a percutaneous approach: 10 patients by vacuum-assisted biopsy (in three of them a complementary surgery was necessary), two by spring-loaded core biopsy (one of them required complementary



**Figure 4.** Parietal thickening of ducts in continuity with intrapapillary duct dilation.



**Figure 5.** Guidewires in ducts, one of them related to the clinical sign of the onset, and the other one containing ultra-sonographic alteration, seen only after the identification of the intrapapillary dilation.

surgery), and one by fine needle aspiration. In six patients, the initial approach was surgical. Therefore, among the patients submitted to the tissue diagnosis, surgery was performed in nine of them, while the other ten received an exclusively percutaneous procedure.

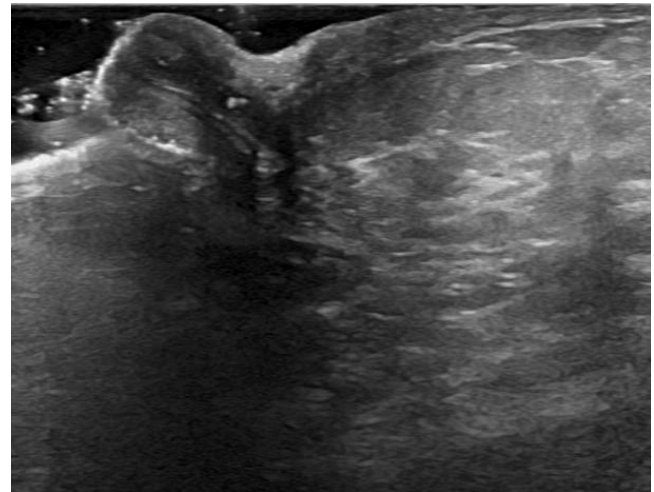
There was one case of invasive carcinoma, with exuberant extra-papillary findings, and two cases of duct carcinoma *in situ*, with discrete extra-papillary finding (15.8% of the biopsied patients).

In three patients, atypia was found, always inside a papilloma. In eight patients, papilloma without atypia was encountered.

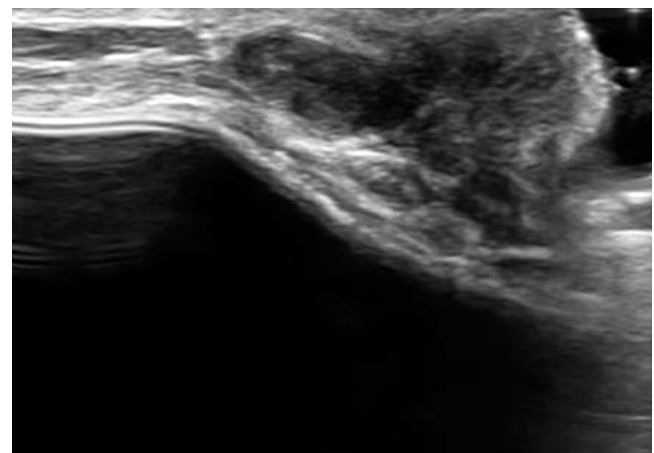
There were also two diagnoses of fibrosis and three diagnoses of galactoforitis (two with histopathological confirmation and one presumed by clinical evolution) (Figure 7).

In the patients who were also investigated by MRI, the intrapapillary duct dilation appeared as an intrapapillary tubular structure with high signal on T2.

Several patients were also investigated by mammography. Some patients presented nonspecific retro-papillary tubular densities (which was compatible to duct ectasia). Several patients had no one mammographic finding. One patient had suspicious microcalcifications and densities.



**Figure 6.** Intra-papillares microcalcifications.



**Figure 7.** Galactoforitis was improved with antibiotic.



## DISCUSSION

The diagnostic approach of patients with pathological nipple discharge can be difficult, and the imaging tests are often normal<sup>1,3</sup>. The cytopathic examination of the secretion discharged has high rates of inconclusive results and sub-ideal specificity<sup>4</sup>. The ductography, besides having low specificity<sup>5</sup>, has been falling into disuse<sup>6</sup> and nowadays it has limited availability. Some studies have shown good accuracy in techniques such as ductoscopy<sup>3</sup> and duct washing cytology<sup>5</sup>, however, besides invasive, these techniques are rarely available<sup>7</sup>. The MRI has been used in some centers to evaluate papillary discharge, and one author found that the positive predictive value for carcinoma of this symptom falls from 5.7 to 4% if the resonance does not show suspicious changes<sup>8</sup>. He concluded that these data may enable an approach that carries the follow-up of these patients, but 4% is still slightly above of the 2% positive predictive value normally accepted to assign the category BI-RADS 3 to findings in asymptomatic patients, showing that its conclusion still deserves further reflection.

The majority of the patients with pathological nipple discharge do not have any relevant disease in the breasts, but a subgroup of these patients may present potentially serious diseases<sup>5,9</sup>. When in the imaging examinations there are no findings, the doctor must decide between adopting an expectant management or resecting the retroareolar duct as a way to eliminate the symptom and also to investigate its etiology. The blind excision of retroareolar ducts, however, brings the risk of not withdrawing a peripherally situated lesion, interrupting the exteriorization of the discharge produced by this lesion and potentially delaying the diagnosis of a malignant disease.

With a specific diagnosis of the diseased duct, the surgical treatment can be directed and less aggressive. In some cases, with small size lesions, a percutaneous approach might also be possible<sup>10</sup>. This percutaneous approach is supported by our data.

The ultrasound sign described herein may be difficult to identify previously when it is not known. In our experience, we spent six years without identifying it again after the first time, because

we were not aware of its potential importance. It is probably right to say that careful examination of the nipple is an often-neglected step in breast ultrasonography. This step requires special maneuvers, such as using large amounts of gel (Figures 2 and 3), or laterally compressing the papilla to rectify the ducts (Figure 6), as described by Stavros<sup>11</sup> and da Costa et al.<sup>12</sup>.

When we specifically look for it, the intrapapillary duct dilation is easy to identify. Moreover, our data shows that it helps to find out the diseased duct and that it seems to be frequent in cases of pathological nipple discharge.

In many of our patients, there was a relevant extra-papillary lesion; in three of them the intrapapillary duct dilation helped to find out this lesion, suggesting that it is not just a diagnostic curiosity, but a way to increase the sensitivity of the breast ultrasonography.

We did not find out any previous description of this sign in the literature. There are some pictorial essays on duct ectasias and nipple lesions in the literature, and one of them shows an intraductal papillary dilation containing liquid, but it does not recognize this situation as an important diagnostic element<sup>13</sup>.

The three cases of galactoforitis were an interesting finding. This diagnosis is not very well remembered usually in the context of the patient with pathological nipple discharge.

## CONCLUSION

The intrapapillary dilation of a duct segment is a new ultrasonography sign that adds diagnostic value to the exam without increasing its costs. It helps to sort relevant diseases in women with pathological nipple discharge and to find out the specific site of the cause of the discharge. Its identification may increase the sensitivity of the breast ultrasonography helping guide the treatment, avoiding unnecessary surgeries and reducing the size of surgeries.

Additional research is needed to determine its prevalence in patients with pathological nipple discharge, besides to its positive and negative predictive values for malignant diseases, atypia, papilloma and galactoforitis.

## REFERENCES

1. Richards T, Hunt A, Courtney S, Umeh H. Nipple discharge: a sign of breast cancer? *Ann R Coll Surg Engl*. 2007;89:124-6. <https://doi.org/10.1308/003588407X155491>
2. van Gelder L, Bisschops RH, Menke-Pluymers MB, Westenend PJ, Plaisier PW. Magnetic resonance imaging in patients with unilateral bloody nipple discharge; useful when conventional diagnostics are negative? *World J Surg*. 2015;39(1):184-6. <https://doi.org/10.1007/s00268-014-2701-1>
3. Fisher CS, Margenthaler JA. A look into the ductoscope: its role in pathologic nipple discharge. *Ann Surg Oncol*. 2011;18(11):3187-91. <https://doi.org/10.1245/s10434-011-1962-2>
4. Gupta RK, Gaskell D, Dowle CS, Simpson JS, King BR, Naran S, et al. The role of nipple discharge cytology in the diagnosis of breast disease: a study of 1948 nipple discharge smears from 1530 patients. *Cytopathology*. 2004;15:326-30. <https://doi.org/10.1111/j.1365-2303.2004.00169.x>

5. Hou MF, Tsai KB, Ou-Yang F, Lin HJ, Liu CS, Chai CY, et al. Is a one-step operation for breast cancer patients presenting nipple discharge without palpable mass feasible? *Breast*. 2002;11:402-7. <https://doi.org/10.1054/brst.2002.0441>
6. Nazario ACP, Rego MF, Oliveira VM. Nódulos benignos da mama: uma revisão dos diagnósticos diferenciais e conduta. *Rev Bras Ginecol Obstet*. 2007;29(4):211-9. <http://dx.doi.org/10.1590/S0100-72032007000400008>
7. Mokbel K, Escobar PF, Matsunaga T. Mammary ductoscopy: current status and future prospects. *Eur J Surg Oncol*. 2005;31:3-8. <https://doi.org/10.1016/j.ejso.2004.10.004>
8. Bahl M, Gadd MA, Lehman C. Diagnostic Utility of MRI After Negative or Inconclusive Mammography for the Evaluation of Pathologic Nipple Discharge. *AJR Am J Roentgenol*. 2017;209:1404-10. <https://doi.org/10.2214/AJR.17.18139>
9. Seow JH, Metcalf C, Wylie E. Nipple discharge in a screening programme: imaging findings with pathological correlation. *J Med Imaging Radiat Oncol*. 2011;55(6):577-86. <https://doi.org/10.1111/j.1754-9485.2011.02294.x>
10. Torres-Tabanera M, Alonso-Bartolomé P, Vega-Bolivar A, Sánchez-Gómez SM, Lag-Asturiano E, Sainz-Miranda M, et al. Percutaneous microductectomy with a directional vacuum-assisted system guided by ultrasonography for the treatment of breast discharge: experience in 63 cases. *Acta Radiol*. 2008;49(3):271-6. <https://doi.org/10.1080/02841850701769793>
11. Stavros AT. Breast anatomy: the basis for understanding sonography. In: Stavros AT. *Breast ultrasound*. Philadelphia: Lippincott Williams & Wilkins; 2004. p.85-9.
12. Da Costa D, Taddese A, Cure ML, Gerson D, Poppiti R, Esserman LE. Common and Unusual Diseases of the Nipple Areolar Complex. *RadioGraphics*. 2007;27:S65-77. <https://doi.org/10.1148/rg.27si075512>
13. Eiada R, Chong J, Kulkarni S, Goldberg F, Muradali D. Papillary Lesions of the Breast: MRI, Ultrasound, and Mammographic Appearances. *AJR Am J Roentgenol*. 2012;198:264-71. <https://doi.org/10.2214/AJR.11.7922>