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# 乳腺钼靶联合超声和 CA153、CEA、CA125 在早期乳腺浸润性导管癌中的应用

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**[摘要]** 目的: 探究乳腺钼靶联合超声以及血清糖链抗原153(carbohydrate antigen 153, CA153)、血清癌胚抗原(carcinoembryonic antigen, CEA)、血清糖链抗原125(carbohydrate antigen 125, CA125)在诊断早期乳腺浸润性导管癌中的应用价值, 为患者的临床诊断提供指导。方法: 选择2017年2月至2019年7月皖北煤电集团总医院收治的60例早期乳腺浸润性导管癌患者作为观察组, 另选择同期皖北煤电集团总医院收治的60例良性乳腺肿块患者作为对照组。对比两组患者的乳腺钼靶和超声的影像学特征以及血清CA153、CEA和CA125阳性率, 同时对乳腺钼靶、超声和肿瘤标志物检测及3项联合在早期乳腺浸润性导管癌中的诊断效能进行比较。结果: 两组患者在乳腺钼靶和超声上均有典型性特征, 差异有统计学意义( $P < 0.05$ )。观察组患者的血清CA153、CEA和CA125阳性检出率均明显高于对照组, 差异有统计学意义( $P < 0.05$ )。三项联合检查在诊断早期乳腺浸润性导管癌中的敏感度、准确度和阴性预测值分别为93.33%、88.33%和92.59%, 均明显高于乳腺钼靶、乳腺超声和肿瘤标志物检测(分别为73.33%、74.17%、73.77%; 76.67%、77.50%、7.05%; 70.00%、72.50%、71.43%), 差异有统计学意义( $P < 0.05$ )。三项联合检查的特异度(83.33%)、阳性预测值(84.85%)与乳腺钼靶、乳腺超声和肿瘤标志物检测(分别为75.00%、78.83%、75.00%和74.58%、77.97%、73.68%)比较, 差异无统计学意义( $P > 0.05$ )。结论: 乳腺钼靶联合超声和血清CA153、CEA、CA125检测能够有效提高早期乳腺浸润性导管癌的诊断准确率, 对其早期诊治具有重要意义。

**[关键词]** 乳腺浸润性导管癌; 乳腺钼靶; 超声检查; 糖链抗原153; 癌胚抗原

## Application of mammography combined with ultrasound and CA153, CEA, CA125 in early-stage invasive ductal carcinoma of breast

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**Abstract** **Objective:** To research the clinical application of mammography combined with ultrasonography and serum carbohydrate antigen 153 (CA153), serum carcinoembryonic antigen (CEA), serum carbohydrate antigen

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125 (CA125) in the diagnosis of early-stage invasive ductal breast carcinoma. **Methods:** From February 2017 to July 2019, 60 patients with early-stage invasive ductal breast carcinoma were selected as a observation group, and 60 cases patients with benign breast masses were selected as a control group. The imaging features of mammography and ultrasound, as well as the positive rates of serum CA153, CEA and CA125 were compared between the 2 groups. Meanwhile, the diagnostic efficacy of mammography, ultrasound, tumor markers detection and the combination of the three in the diagnosis of early-stage invasive ductal breast carcinoma were compared. **Results:** Both groups had typical characteristics in mammography and breast ultrasound, and the difference was statistically significant ( $P<0.05$ ). The detection rates of positive serum CA153, CEA and CA125 were significantly higher in the observation group than in the control group, and the differences were statistically significant ( $P<0.05$ ). The sensitivity, accuracy and negative predictive value of the three combined examinations in the diagnosis of early-stage invasive ductal breast carcinoma were 93.33%, 88.33% and 92.59%, respectively, which were significantly higher than those of mammography, breast ultrasound and tumor markers detection (73.33%, 74.17%, 73.77%; 76.67%, 77.50%, 77.05%; 70.00%, 72.50%, 71.43%, respectively), and the differences were statistically significant ( $P<0.05$ ). The specificity (83.33%) and positive predictive value (84.85%) of the three combined examinations were not statistically significant ( $P>0.05$ ) compared with those of mammography, breast ultrasound and tumor marker testing (75.00%, 78.83%, 75.00% and 74.58%, 77.97%, 73.68%, respectively). **Conclusion:** Mammography combined with ultrasound and serum CA153, CEA, CA125 can effectively improve the diagnostic accuracy of early-stage invasive ductal breast carcinoma, which is of great significance for its early diagnosis and treatment.

**Keywords** invasive ductal breast carcinoma; mammography; ultrasonography; carbohydrate antigen 153; carcinoembryonic antigen

乳腺癌从组织学上可分为非浸润性癌和浸润性癌两大类, 乳腺浸润性导管癌作为临床上常见的乳腺癌类型, 占乳腺癌整体发病率的60%~80%<sup>[1-2]</sup>。乳腺钼靶和超声技术的不断发展使乳腺癌在早期影像学诊断方面取得了长足进步, 但仍存在不足。乳腺钼靶在显示钙化灶方面较为敏感, 但对于致密型乳腺肿块的检出率较低, 超声受操作者技术水平影响, 诊断结果客观性不高<sup>[3]</sup>。糖链抗原153(carbohydrate antigen 153, CA153)、癌胚抗原(carcinoembryonic antigen, CEA)和糖链抗原125(carbohydrate antigen 125, CA125)等肿瘤标志物均可有效证实肿瘤的存在和生长, CA153、CEA、CA125联合影像学手段能够明显提高乳腺癌的诊断准确率<sup>[4]</sup>。本研究以病理结果为金标准, 对乳腺钼靶、乳腺超声、肿瘤标志物检测以及三者联合在诊断早期乳腺浸润性导管癌上的诊断价值进行对比性评价, 旨在提高其诊断准确率。

## 1 对象与方法

### 1.1 对象

选择2017年2月至2019年7月皖北煤电集团总

医院收治的60例早期乳腺浸润性导管癌患者作为观察组, 患者均为女性, 年龄27~75(42.69±5.19)岁, 均为单侧乳腺癌, 左、右乳各30例, 肿块大小0.6 cm×0.5 cm~4.1 cm×3.2 cm。另选择同期皖北煤电集团总医院收治的60例良性乳腺肿块患者作为对照组, 患者均为女性, 年龄22~65(42.54±5.03)岁, 其中单侧肿块49例(左乳29例, 右乳20例), 双侧乳块11例。两组患者的一般资料比较差异无统计学意义( $P>0.05$ ), 有可比性。

纳入标准: 1)所有患者均经病理学诊断明确为乳腺浸润性导管癌或良性乳腺肿块; 2)对本研究知情, 均签署知情同意书; 3)术前均在皖北煤电集团总医院顺利完成乳腺钼靶、超声检查及相关肿瘤标志物检测, 病历资料完整。

排除标准: 1)有乳腺有创性检查或手术史者; 2)妊娠期或哺乳期妇女; 3)恶性肿瘤或其他恶性疾病; 4)严重凝血功能障碍, 肝、肾功能异常, 糖尿病等疾病。

### 1.2 方法

#### 1.2.1 乳腺钼靶检查

检查仪器采用德国西门子Mammomat Fusion乳腺数字X射线机进行, 乳腺钼靶摄片取头尾位(CC

位)和内外斜位(MLO位),必要时加拍侧位和局部放大摄片,曝光模式为全自动曝光模式,将扫描图像传送至工作站内,详细观察肿块数量、大小、形态、边界,内部钙化情况以及皮肤和乳头状况等,由2名经验丰富的影像学医师根据肿块情况结合相关诊断标准作出最终诊断。

### 1.2.2 乳腺超声检查

患者取仰卧位,双臂上举充分暴露双乳及腋窝,仪器采用Philips HD7彩色多普勒超声仪,探头频率为7~13 MHz,以乳头为中心对乳腺各个象限进行全面扫描,检查乳腺肿块位置、形态特征、回声及内部钙化和血流信号等。

### 1.2.3 肿瘤标志物检测

次日清晨采集两组患者的空腹静脉血5 mL,抗凝处理后以3 000r/min的速度进行离心,离心5 min后取血清保存待测,采用德国罗氏COBAS601全自动电化学发光免疫分析仪对其CA153、CEA和CA125水平进行测定,试剂盒由罗氏公司提供,检测步骤严格按照试剂盒说明书进行。

## 1.3 诊断标准

### 1.3.1 乳腺钼靶检查诊断标准

1)肿块边界与周围组织模糊不清,局部存在不规则致密性浸润影;2)肿块内部微钙化,呈杆状、泥沙状或分叉状,钙化灶数量 $\geq 5$ 个/ $\text{cm}^2$ ;3)腋窝淋巴结肿大;4)乳房局部皮肤增厚,乳头内陷或呈漏斗状,肿块周围有粗大血管影,周围乳腺结构紊乱。

### 1.3.2 乳腺超声检查诊断标准

1)肿块边界模糊,边缘呈毛刺状或分叶状,肿块形状不规则,有不规则低回声区;2)肿块无明显包膜,内部可见微钙化;3)低回声区内衰减和团块纵横比 $>1$ ;4)肿块内血流信号丰富,形态紊乱,血

流信号等级在II级以上;5)腋窝淋巴结肿大。

### 1.3.3 肿瘤标志物检测诊断标准

1)血清CA125  $>35$  U/mL为阳性;2)血清CEA  $>6$  ng/mL为阳性;3)血清CA153  $>28$  U/mL为阳性。上述任意1项阳性时视为联合检测阳性。

### 1.3.4 联合诊断标准

若3种检查结果报告一致,则出具统一报告;3种检查结果不一致时,由2名经验丰富的影像学医师依据上述3种检查结果进行综合分析,共同协商给出一致意见。

## 1.4 统计学处理

采用SPSS 20.0统计软件对各项数据资料进行处理。计量资料采用均数 $\pm$ 标准差( $\bar{x}\pm s$ )表示,计数资料采用例(%)表示,数据比较分别采用双侧 $t$ 检验和 $\chi^2$ 检验。 $P<0.05$ 为差异有统计学意义。

## 2 结果

### 2.1 两组患者的乳腺钼靶表现特征

观察组患者不规则包块、边界模糊、肿块边缘呈毛刺状或分叶状、泥沙样或分叉状微钙化、局部致密性浸润、粗大血管影、局部皮肤增厚、腋窝淋巴结肿大等乳腺钼靶表现特征的比例均明显大于对照组,差异均有统计学意义(均 $P<0.05$ ;表1,图1~3)。

### 2.2 两组患者的乳腺超声表现及特征

观察组患者肿块边界模糊、边缘呈毛刺状或分叶状、有不规则低回声区、纵横比 $>1$ 、血流信号丰富等乳腺超声表现特征的比例均明显大于对照组,差异均有统计学意义(均 $P<0.05$ ;表2,图4~6)。

表1 两组患者的乳腺钼靶表现及特征对比( $n=60$ )

Table 1 Comparison of mammography manifestations and characteristics between the 2 groups ( $n=60$ )

组别	乳腺钼靶表现及特征/[例(%)]							
	不规则包块	边界模糊	肿块边缘呈毛刺征或分叶状	泥沙样或分叉状微钙化	局限致密性浸润	粗大血管影	局部皮肤增厚	腋窝淋巴结肿大
观察组	9 (15.00)	31 (51.67)	20 (33.33)	32 (53.33)	14 (23.33)	12 (20.00)	13 (21.67)	16 (26.67)
对照组	2 (3.33)	9 (15.00)	4 (6.67)	11 (18.33)	3 (5.00)	2 (3.33)	2 (3.33)	3 (5.00)
$\chi^2$	4.904	18.15	13.333	15.983	8.292	8.086	9.219	10.568
$P$	0.027	$<0.001$	$<0.001$	$<0.001$	0.004	0.005	0.002	0.001

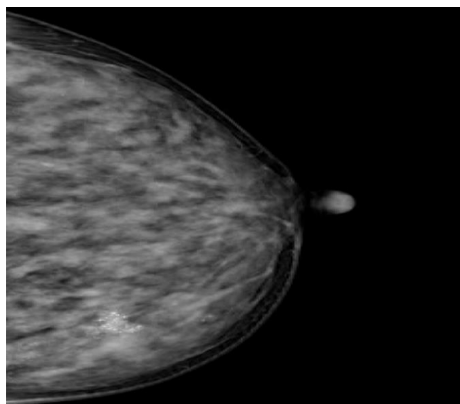


图1 乳腺钼靶示肿块为不规则包块, 可见泥沙样微钙化点, 病理证实为乳腺浸润性导管癌

Figure 1 An irregular shaped mass with sand-like microcalcifications, pathologically confirmed as invasive ductal breast carcinoma

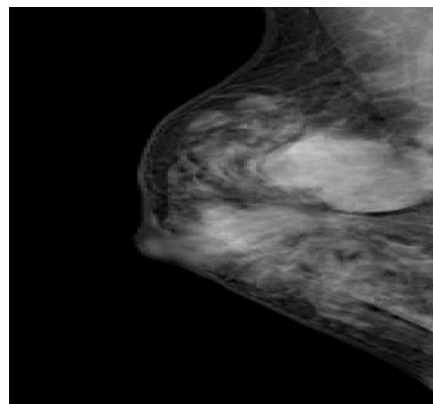


图3 乳腺钼靶示肿块边界较清晰, 形态较规则, 病理证实为乳腺纤维瘤

Figure 3 Mammography shows the boundary of the mass is clear and the shape is regular, which was pathologically confirmed as breast fibroma

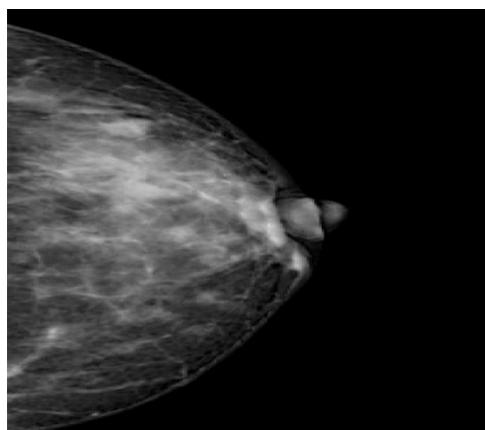


图2 乳腺钼靶示肿块边界模糊, 形态不规则, 病理证实为浸润性导管癌

Figure 2 Mammography shows the tumor has a vague boundary and irregular shape. The tumor is proved to be invasive ductal carcinoma by pathology

### 2.3 两组患者的各项肿瘤标志物的阳性检出率

观察组患者的血清CA153、CEA及CA125阳性检出率均明显高于对照组, 差异有统计学意义 ( $P < 0.05$ , 表3)。

### 2.4 不同检查方法在诊断乳腺浸润性导管癌上的诊断效能

3项联合检查在诊断乳腺浸润性导管癌上的敏感度、特异度、准确度、阳性预测值和阴性预测值分别为93.33%、83.33%、88.33%、84.85%和92.59%, 敏感度、准确度、阴性预测值明显高于乳腺钼靶、乳腺超声和肿瘤标志物检测, 差异有统计学意义 ( $P < 0.05$ )。3项联合检查的特异度、阳性预测值与乳腺钼靶、乳腺超声和肿瘤标志物检测比较差异无统计学意义 ( $P > 0.05$ , 表4)。

表2 两组患者的乳腺超声表现及特征比较 ( $n=60$ )

Table 2 Comparison of breast ultrasound manifestations and characteristics between the 2 groups ( $n=60$ )

组别	乳腺超声表现及特征/[例(%)]						
	边界模糊	肿块边缘呈毛刺状或分叶状	有不规则低回声区	纵横比>1	血流信号丰富	微钙化	腋窝淋巴结肿大
观察组	44 (73.33)	29 (48.33)	10 (16.67)	21 (35.00)	42 (70.00)	33 (55.00)	11 (18.33)
对照组	14 (23.33)	7 (11.67)	2 (3.33)	5 (8.33)	15 (25.00)	10 (16.67)	2 (3.33)
$\chi^2$	30.033	19.206	5.926	12.57	24.361	19.173	6.988
$P$	<0.001	<0.001	0.015	<0.001	<0.001	<0.001	0.008





图4 超声检查示肿块边界模糊, 可见泥沙样的微钙化点, 病理证实为乳腺浸润性导管癌

**Figure 4** Ultrasonography shows the boundary of the mass is indistinct, with sand like microcalcifications. The tumor is pathologically confirmed as invasive ductal breast carcinoma

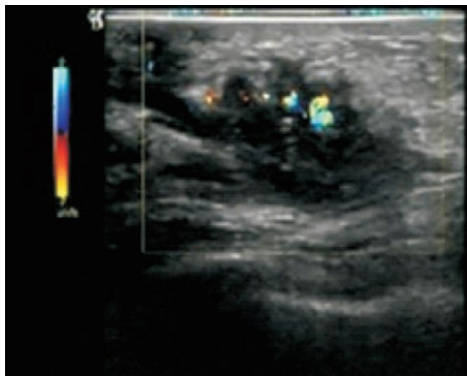


图5 超声检查示肿块边缘呈分叶状, 血流信号丰富, 病理证实为乳腺浸润性导管癌

**Figure 5** Ultrasonography shows the edge of the mass is lobulated with abundant blood flow signals. The tumor is pathologically confirmed as invasive ductal breast carcinoma

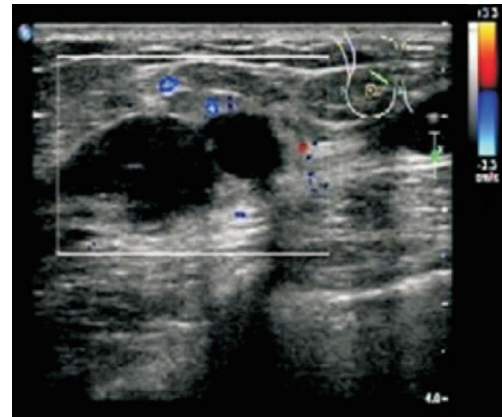


图6 超声检查示肿块形态规则, 血流信号不丰富, 病理证实为乳腺纤维瘤

**Figure 6** Ultrasonography shows the tumor is characterized by regular shape, poor blood flow signal, and is confirmed by pathology as breast fibroma

表3 两组患者各项肿瘤标志物的阳性检出率比较 (n=60)

**Table 3** Comparison of positive detection rates of tumor markers between the 2 groups (n=60)

组别	CA153/ [例(%)]	CEA/ [例(%)]	CA125/ [例(%)]
观察组	37 (61.67)	29 (48.33)	23 (38.33)
对照组	8 (13.33)	4 (6.67)	3 (5.00)
$\chi^2$	29.902	26.123	19.640
P	<0.001	<0.001	<0.001

表4 不同检查方法在诊断乳腺浸润性导管癌上的诊断效能比较

**Table 4** Comparison of diagnostic efficiency of different examination methods in the diagnosis of invasive ductal breast carcinoma

检查方法	敏感度	特异度	准确度	阳性预测值	阴性预测值
乳腺钼靶	73.33% (44/60)*	75.00% (45/60)	74.17% (89/120)*	74.58% (44/59)	73.77% (45/61)*
乳腺超声	76.67% (46/60)*	78.83% (47/60)	77.50% (93/120)*	77.97% (46/59)	77.05% (47/61)*
肿瘤标志物	70.00% (42/60)*	75.00% (45/60)	72.50% (87/120)*	73.68% (42/57)	71.43% (45/63)*
三项联合检查	93.33% (56/60)	83.33% (50/60)	88.33% (106/120)	84.85% (56/66)	92.59% (50/54)*
$\chi^2$	11.391	1.622	10.667	2.8264	9.0180
P	0.010	0.654	0.014	0.4192	0.0291

与3项联合比较, \*P<0.05。

Comparison with the three combined examinations, \*P<0.05.

### 3 讨论

乳腺浸润性导管癌是临床上常见的一类乳腺癌,其原因主要是由于导管内原位癌突破小导管或腺泡基底膜向邻近间质浸润扩散所致<sup>[5-6]</sup>。乳腺浸润性导管癌检出率较高,患者确诊时通常已发展为中期或晚期,及早确诊、治疗对于延长患者生存期、改善生存质量都具有重要意义<sup>[7]</sup>。

乳腺钼靶作为乳腺疾病的基本检查手段,能够对乳腺肿块形状、大小、边缘、密度、钙化等征象进行观察,尤其能够准确识别乳腺组织内各种软组织的异常密度改变,对于乳腺微钙化的检出率最具特异性<sup>[8]</sup>。相关资料<sup>[9]</sup>表明:90%左右的导管原位癌能够被乳腺钼靶检出。乳腺浸润性导管癌的乳腺钼靶典型表现较多,包括边界模糊、形态不规则,边缘毛刺,微钙化、局部致密性浸润、乳房表面局部皮肤改变、血管增多增粗等<sup>[10]</sup>。本研究结果显示:乳腺钼靶在诊断早期乳腺浸润性导管癌的敏感度、特异度、准确度、阳性预测值和阴性预测值分别为73.33%、75.00%、74.17%、74.58和73.77%,仍存在一定局限性。分析原因,乳腺钼靶通常是依靠肿块与正常腺体之间的密度差异和形态学表现对乳腺肿块作出诊断<sup>[11]</sup>。在诊断致密型乳腺时,由于肿块密度与正常腺体组织密度相近,而缺乏对比,故难以对其作出诊断。

乳腺超声能够清晰显示乳房各层组织及内部肿块的形态、结构及邻近组织变化,能够对囊、实性肿块以及致密型肿块进行准确鉴别<sup>[12]</sup>。早期乳腺浸润性导管癌在乳腺超声图上主要表现为:1)形态不规则、边界模糊呈毛刺状或分叶状;2)内部回声不均匀或有不规则低回声区;3)肿块内部及周边多存在动脉型高阻的血流信号,肿块越大血流信号越丰富。本研究结果显示:乳腺超声诊断早期乳腺浸润性导管癌的敏感度、特异度、准确度、阳性预测值和阴性预测值分别为76.67%、78.33%、77.50%、77.97%和77.05%,略高于乳腺钼靶,加之乳腺超声操作简便,可反复多次,可将其作为诊断早期乳腺浸润性导管癌的主要检查手段。然而,乳腺超声诊断比较依赖医生经验,因此在临床上仍需联合其他诊断方式进行联合诊断<sup>[13]</sup>。

CA153、CA125属于糖蛋白,是转移性乳腺癌中的相关抗原,主要分布在乳腺癌细胞内,经乳腺癌细胞释放到机体血液循环中,是诊断乳腺癌的特异性标志物<sup>[14]</sup>。CEA是一种广谱肿瘤标志物,也属于糖蛋白,可用于监测肿瘤的发生、发展,能够与其他肿瘤标志物联合应用于乳腺癌的

临床诊断<sup>[15]</sup>。本研究结果显示:早期乳腺浸润性导管癌患者的CA153、CEA和CA125水平及阳性检出率均明显高于乳腺良性肿块患者。由于肿瘤标志物不具有独特指向性,1种肿瘤标志物会在多种恶性肿瘤中出现,1种肿瘤中能够释放多种肿瘤标志物,因此单一肿瘤标志物具有一定局限性<sup>[16]</sup>。CA153、CA125尽管是诊断乳腺癌的特异性标志物,但临床发现其在乳腺癌早期诊断中的表达量、阳性率较低,诊断意义不大。本研究联合CA153、CEA和CA125对早期乳腺浸润性导管癌进行诊断,其敏感度、特异度、准确度、阳性预测值和阴性预测值分别为70.00%、75.00%、72.50%、73.68%和71.43%,说明CA153、CEA和CA125等肿瘤标志物检测在早期乳腺浸润性导管癌中具有一定的诊断价值。

乳腺钼靶、乳腺超声和CA153、CEA、CA125等肿瘤标志物检测3种检查方式在诊断早期乳腺浸润性导管癌上各有优缺点。本研究将三者联合对早期乳腺浸润性导管癌进行诊断,结果显示3项联合检查在诊断上的敏感度、特异度、准确度、阳性预测值和阴性预测值分别为93.33%、83.33%、88.33%、84.85%和92.59%,敏感度、准确度和阴性预测值均明显高于乳腺钼靶、乳腺超声和肿瘤标志物检测。结果表明:3种方式联合诊断能够有效弥补单一检查存在的不足,减少单一检查的误差,从而能够显著提高其诊断准确率。

综上所述,乳腺钼靶联合超声和CA153、CEA、CA125检测能够有效提高早期乳腺浸润性导管癌的诊断准确率,为其临床诊治提供更加可靠的诊断依据,值得在临床上积极推广。

### 参考文献

1. 孙亚冬,李连方,刘山青,等.乳腺导管原位癌与导管原位癌伴微浸润的临床病理特点及预后对比分析[J].中国实验诊断学,2019,23(5):818-822.  
SUN Yadong, LI Lianfang, LIU Shanqing, et al. Comparative analysis of clinicopathological features and prognosis of breast ductal carcinoma in situ and ductal carcinoma in situ with microinvasion[J]. Chinese Journal of Laboratory Diagnosis, 2019, 23(5): 818-822.
2. Koh VC, Lim JCT, Thike AA, et al. Behaviour and characteristics of low-grade ductal carcinoma in situ of the breast: Literature review and single-centre retrospective series[J]. Histopathology, 2019, 74(7): 970-987.
3. 邝宇良,黄胜福,李安连,等.乳腺癌钼靶X线联合血清CA125、CA153、CEA检查对早期乳腺癌临床诊断的推广[J].影像研究

- 与医学应用, 2018, 2(22): 239-241.
- KUANG Yuliang, HUANG Shengfu, LI Anlian, et al. Promotion of molybdenum target X-ray combined with serum CA125, CA153 and CEA in the clinical diagnosis of early breast cancer[J]. *Journal of Imaging Research and Medical Applications*, 2018, 2(22): 239-241.
4. 李红娜, 李童, 罗辉, 等. 乳腺浸润性导管癌超声声像图特征与 ER、PR 表达的相关性研究[J]. *中国实验诊断学*, 2017, 21(6): 1058-1059.

LI Hongna, LI Tong, LUO Hui, et al. Correlation between ultrasound features and ER, PR expression in breast invasive ductal carcinoma[J]. *Chinese Journal of Laboratory Diagnosis*, 2017, 21(6): 1058-1059.

  5. 齐刚, 彭泽品, 朱龙飞, 等. 乳腺浸润性小叶癌与浸润性导管癌乳腺钼靶 X 线检查表现比较[J]. *安徽医学*, 2019, 40(2): 184-186.

QI Gang, PENG Zepin, ZHU Longfei, et al. Comparison of mammography findings between invasive lobular carcinoma and invasive ductal carcinoma[J]. *Anhui Medical Journal*, 2019, 40(2): 184-186.

  6. Yilmaz R, Akpınar Y, Ozyavuz I, et al. Synchronous metastatic leiomyosarcoma and primer invasive ductal carcinoma tumors in the same breast: Mammography, ultrasonography, and magnetic resonance imaging findings[J]. *Breast J*, 2019, 25(2): 310-311.
  7. Redmond CE, Healy GM, Murphy CE, et al. The use of ultrasonography and digital mammography in women under 40 years with symptomatic breast cancer: A 7-year Irish experience[J]. *Ir J Med Sci*, 2017, 186(1): 63-67.
  8. 含笑, 胡茂能, 余梁, 等. 乳腺钼靶摄影中乳腺癌影像学表现和相关肿瘤标志物表达的相关性[J]. *安徽医学*, 2019, 40(1): 5-8.

HAN Xiao, HU Maoneng, YU Liang, et al. Correlation between imaging findings of breast cancer and related tumor markers in mammography[J]. *Anhui Medical Journal*, 2019, 40(1): 5-8.

  9. 吴晓刚. 乳腺钼靶 X 射线摄片联合 4 种血清肿瘤标志物对乳腺癌的诊断价值[J]. *影像研究与医学应用*, 2018, 2(4): 184-186.

WU Xiaogang. Diagnostic value of mammography combined with four serum tumor markers in breast cancer[J]. *Journal of Imaging Research and Medical Applications*, 2018, 2(4): 184-186.

  10. 朱引峰. 乳腺钼靶 X 线片联合肿瘤标志物诊断乳腺癌的价值[J]. *中国妇幼保健*, 2017, 32(15): 3682-3683.

ZHU Yinfeng. The value of mammography combined with tumor markers in the diagnosis of breast cancer[J]. *Maternal and Child Health Care of China*, 2017, 32(15): 3682-3683.

  11. 聂薇薇, 程娟娟. 乳腺癌钼靶 X 射线征象与血清相关肿瘤标志物、MMP-9 相关关系研究[J]. *湖南师范大学学报(医学版)*, 2016, 13(1): 79-81.

NIE Weiwei, CHENG Juanjuan. Study on the correlation between molybdenum target X-ray signs of breast cancer and serum tumor markers and MMP-9[J]. *Journal of Hunan Normal University(Medical Sciences)*, 2016, 13(1): 79-81.

  12. 王群拴, 黎小花. 核磁共振结合血清肿瘤标志物及细胞因子检测在乳腺癌诊断中的应用价值研究[J]. *陕西医学杂志*, 2019, 48(10): 1295-1297.

WANG Qunshuan, LI Xiaohua. Study on the application value of nuclear magnetic resonance combined with serum tumor markers and cytokines detection in the diagnosis of breast cancer[J]. *Shaanxi Medical Journal*, 2019, 48(10): 1295-1297.

  13. 韩龙才, 李玉柱, 张华, 等. 超声、钼靶、MRI 及肿瘤标志物联合检测在乳腺癌诊断中的价值研究[J]. *标记免疫分析与临床*, 2016, 23(11): 1314-1316.

HAN Longcai, LI Yuzhu, ZHANG Hua, et al. Study on the value of combined detection of ultrasound, molybdenum target, MRI and tumor markers in the diagnosis of breast cancer[J]. *Labeled Immunoassays and Clinical Medicine*, 2016, 23(11): 1314-1316.

  14. 成祥君, 杨璐, 张伟, 等. 不同分子分型乳腺癌血清肿瘤标志物的表达差异与肿瘤复发转移的影响因素[J]. *临床检验杂志*, 2019, 37(12): 893-896.

CHENG Xiangjun, YANG Lu, ZHANG Wei, et al. Expression of serum tumor markers in different molecular subtypes of breast cancer and influencing factors of tumor recurrence and metastasis[J]. *Chinese Journal of Clinical Laboratory Science*, 2019, 37(12): 893-896.

  15. 李彦魁, 杨文涛, 吴茜. 不同病理分期乳腺癌患者免疫功能、肿瘤标志物及炎症因子的变化分析[J]. *海南医学院学报*, 2019, 25(7): 515-518.

LI Yankui, YANG Wentao, WU Xi. Changes of immune function, tumor markers and inflammatory factors in patients with breast cancer at different pathological stages[J]. *Journal of Hainan Medical University*, 2019, 25(7): 515-518.

  16. 王瑛, 李张爱, 黄华. 多种肿瘤标志物联合检测在女性乳腺癌筛查诊断中的价值[J]. *中国妇幼保健*, 2019, 34(6): 1274-1276.

WANG Ying, LI Zhangai, HUANG Hua. The value of combined detection of multiple tumor markers in screening and diagnosis of female breast cancer[J]. *Maternal and Child Health Care of China*, 2019, 34(6): 1274-1276.

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