A pictorial review of chronic renal failure-related breast diseases

Poster No.: C-1040
Congress: ECR 2014
Type: Educational Exhibit
Keywords: Education and training, Screening, Education, Ultrasound, Mammography, Kidney, Breast
DOI: 10.1594/ecr2014/C-1040

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Learning objectives

The aim of this poster is to:

- Review the various breast diseases arising in patients with chronic renal failure.

- Explain the utility of imaging in the diagnosis of affecting the breast lesions of patients with chronic renal failure.

Background

Patients with chronic renal failure could have various breast diseases. However, not much is known about the diseases that include benign or malignant lesions. It is important for radiologists to recognize the breast disease entities with chronic renal failure to ensure appropriate patient care.

Mammography is typically used for first-line imaging. If necessary, it is followed by ultrasound (US) or magnetic resonance imaging (MRI) for the evaluation and characterization of breast lesions.

Screening mammography is recommended in the general population in order to reduce the mortality and morbidity of breast cancer. It is recommended that a mammography get screened every year starting at age 40 if you are at average risk.

Findings and procedure details

Screening mammography for dialysis patients

Screening mammograms are not recommended as routine procedures for dialysis patients. For individual patients, the effectiveness of screening mammograms will depend on transplant status, personal cancer risk factors, and expected survival. However, incidences of malignancy-associated calcification and hence biopsy recommendation rate were slightly greater for dialysis patients.
Breast diseases occurring in patients with chronic renal failure are:

1. **Immunosuppressant drug (cyclosporin A) related breast disease**
   - **Benign**: fibroadenoma
   - **Malignant**: invasive ductal carcinoma (IDC), ductal carcinoma in situ (DCIS)

2. **Breast diseases related with hemodialysis.**
   - Collateral vessel engorgement
   - Diffuse breast enlargement
   - Post-traumatic hematoma or fat necrosis

3. **Diabetic mastopathy**

### 1. **Immunosuppressant drug (cyclosporin A) related breast disease**

- **Benign**

  Cyclosporin A has been implicated in the development of benign breast lesions. Breast fibroadenomas can developed in kidney-transplant recipients undergoing long-term cyclosporin A immunosuppressive therapy. The mechanism of cyclosporin in the induction of fibroadenomas remains unclear. The possible mechanisms include direct effect on fibroblasts, hormonal action and, less likely, resolution of uremia.

  Mammography showed multiple non-calcified well-circumscribed masses (fig. 1). US showed hypoechoic, well-circumscribed and solid masses (fig. 2). They have a tendency to be larger, multiple, and bilateral, relative to those that develop in female who have not undergone organ transplantation or immunosuppressive therapy.

- **Malignant**

  Increasing number of studies on the development of malignancies after organ transplantations show a correlation with immunosuppressive therapy. The general incidence of all malignancies depends on the duration and intensity of immunosuppression. The tumors manifests more aggressive in patients after transplantations with immunosuppressive therapy (fig. 3-7).
The factors causing the development of malignancies in renal transplant patients include immune surveillance mechanism impairment, chronic antigen stimulation of graft, reactivation of latent oncoviruses and direct oncogenic impact of immunosuppressive substances.

Preventive evaluation should guarantee early detection of cancer. Appropriate treatment, without cessation of immunosuppressive therapy, is needed.

2. Breast diseases related with hemodialysis

- Diffuse breast enlargement

Breast enlargement is a rare complication of hemodialysis arteriovenous access that occurred as a consequence of superior vena cava occlusions due to fibrosing mediastinitis (fig. 8-10). Unilateral breast edema may also be caused by increased hydrostatic pressure in arteriovenous dialysis complications or venous obstruction (fig. 11-12). The differential diagnosis includes inflammatory breast cancer.

Mammographic finding includes breast enlargement with increased parenchymal density, trabecular thickening and skin thickening.

It may be treated with a percutaneous procedure.

- Collateral vessel engorgement

Bilateral venous engorgement occurs secondary to poor venous return to the heart, as in superior vena cava obstruction or congestive heart failure. Upper extremity hemodialysis shunts may result in unilateral venous engorgement of the breast due to hyperdynamic venous flow through the upper arm and chest.

At mammography and US, engorged collateral vessels appears as thickened and tortuous tubular structures, usually in a superficial location (fig. 13).

- Post-traumatic hematoma or fat necrosis

In patients with chronic renal failure, the procoagulant abnormalities persist, but in addition patients start to exhibit platelet dysfunction that typically manifests with an increased risk of cutaneous, mucosal, or serosal bleeding. Several factors are thought to contribute to platelet dysfunction in patients with chronic renal failure; impaired function of platelet glycoprotein-like GPIIb/IIIa, altered release of ADP and serotonin from platelet granules, and faulty arachidonic acid and prostaglandin metabolism, which all lead to impaired platelet adhesion and aggregation.
The breast manifestations of platelet dysfunction in patients include easy bruising of the skin or post-traumatic hematoma. The age of the blood products determines the specific appearance. A hyperacute hematoma may appear as a simple cyst with internal echoes, which rapidly becomes a complicated cyst (fig. 14-15).

3. Diabetic mastopathy

Chronic renal failure is a serious complication of diabetes mellitus. Diabetic mastopathy is a rare tumor-like fibrous proliferation of the breasts that occurs in patients who have a long history of type 1 diabetes mellitus. It is an uncommon form of lymphocytic mastitis and stromal fibrosis.

Physical examination reveals palpable discrete masses or diffuse nodularity, both predominantly in the subareolar region.

At mammography, the breasts usually appear diffusely dense, making visualization of a discrete mass difficult. US demonstrates irregular hypoechoic masses with marked posterior acoustic shadowing (fig. 16).

Given the nondiagnostic imaging features, core-needle biopsy is usually warranted. Diabetic mastopathy can be self-limited, however, recurrent masses are not uncommon.

Images for this section:
Fig. 1: Cyclosporin A related fibroadenoma. A 49-year-old woman presented with palpable masses on both breasts. She received a renal transplantation about 6 years ago and cyclosporin A therapy. Mammography showed heterogeneously dense breasts.
Fig. 2: Cyclosporin A related fibroadenoma. US demonstrated multiple circumscribed oval hypoechoic masses in both breasts. Subsequent biopsy revealed fibroadenomas.

Fig. 3: Cyclosporin A related DCIS. A 36-year-old woman complained of palpable masses in both breasts. She underwent a renal transplantation about 4 years ago and received cyclosporin A therapy. Mammography showed multiple well-circumscribed masses in both breasts.
Fig. 4: Cyclosporin A related DCIS. US demonstrated multiple large well-circumscribed hypoechoic masses in both breasts. The masses were confirmed as fibroadenomas by core-needle biopsy. Repeat mammography and US revealed that her breast masses became progressively larger and multiplied in number.

Fig. 5: Cyclosporin A related DCIS. After 3 years, follow up breast US demonstrated an indistinct irregular hypoechoic lesion in right lower inner breast. The lesion showed
increased vascularity in peripheral portion of the lesion on color doppler US. On breast MR, there was a segmental-distributed linear ductal non-mass like enhancement in right lower inner breast on dynamic contrast enhanced FLASH subtraction image. The results of core-needle biopsy confirmed the lesion as DCIS.
**Fig. 6:** Cyclosporin A related IDC. A 51-year-old woman complained of a palpable mass in left breast. She underwent a renal transplantation about 16 years ago and received cyclosporin A therapy, and a right mastectomy due to breast cancer about 1 year ago. She complained of a palpable mass in left breast. Mammography revealed newly developed linear, pleomorphic microcalcifications in left outer breast compared with that was performed about 1 year ago.

![Image](image_url)

**Fig. 7:** Cyclosporin A related IDC. US demonstrated an indistinct irregular hypoechoic mass in left outer breast with internal microcalcifications. The mass showed increased vascularity in the peripheral portion on color doppler US. On breast MRI, the mass showed irregular, inhomogeneous enhancement on dynamic enhanced FLASH subtraction image. The core-needle biopsy revealed IDC and a left mastectomy was done.

![Image](image_url)
Fig. 8: Bilateral breast enlargement. A 67-year-old woman with end-stage renal disease due to diabetes mellitus complained of massive bilateral breast enlargement. The patient had undergone hemodialysis for 7 years and had been receiving hemodialysis through a right upper-extremity basilic transposition fistula for the previous 2 years.
**Fig. 9:** Bilateral breast enlargement. Fistulography by the right access showed complete obstruction of the SVC and a prominent collateral pathway through the lateral thoracic vein (arrows). The patient underwent percutaneous angioplasty with a 12 mm x 4-cm balloon. Fistulography after endovascular treatment showed the patent superior vena cava.
Fig. 10: Bilateral breast enlargement. Follow-up chest PA radiograph obtained 3 months later showed marked improvement of edema in both breasts.
Fig. 11: Unilateral breast edema. A 51-year-old woman with chronic renal failure and hemodialysis complained of a unilateral swelling of right upper extremity and face. Mammography showed diffuse edema and skin thickening in right breast and left inner breast.

Fig. 12: Unilateral breast edema. US showed diffuse edema and skin thickening in right breast and also in focal area of left inner breast. She received treatment for stenosis
on innominate vein with balloon angioplasty and a stent about 2 months ago. Unilateral breast edema was possibly due to venous stenosis.

Fig. 13: Collateral vessel engorgement. A 52-year-old woman with chronic renal failure had undergone hemodialysis for 7 years. Mammography showed multiple thickened and tortuous tubular structures, usually in a superficial location, suggesting collateral vessels. US showed dilated superficial veins.
**Fig. 14:** Post-traumatic hematoma. A 60-year-old woman with chronic renal failure had undergone hemodialysis for 7 years. She complained of palpable masses in both breasts. She had a history of breast trauma about 2 months ago and bruise was observed along the left thoracic wall. Mammography showed multiple indistinct masses in both breasts.

**Fig. 15:** Post-traumatic hematoma. US showed complex echoic masses and edema of the surrounding tissues. The lesions were presumed fat necrosis and/or hematomas. The
left breast mass was confirmed as hemorrhage by core-needle biopsy. There was no follow up examination.

**Fig. 16:** Diabetic mastopathy. A 39-year-old woman who had a longstanding diabetes and chronic renal failure presented with palpable masses in both breasts. At mammography, the breasts appeared heterogeneous dense. US demonstrated irregular hypoechoic masses in both breasts with marked posterior acoustic shadowing. Biopsy revealed stromal fibrosis with perivascular infiltration by mature B-cell lymphocytes, findings that were consistent with diabetic mastopathy.
Conclusion

Patients with chronic renal failure could have various breast diseases that include benign or malignant lesions.

The knowledge of breast disease spectrum associated with chronic renal failure would be helpful for the differential diagnosis.

Screening mammograms are not recommended as routine procedures for dialysis patients. However, in addition to these knowledge, correlation with patient history and presentation would be useful for improving diagnostic accuracy and considering whether to recommend biopsy or not.

Personal information

References


