



Bilateral breast ultrasound was performed which showed diffusely thickened stromal and glandular tissue bilaterally (Figure 1). In addition, a large well defined hypoechoic lesion having smooth margins was also noted occupying upper half of right breast measuring  $9.8 \times 5.2$  cm, showing moderate vascularity on color Doppler evaluation (Figure 2). There was no skin thickening or nipple retraction. No significant axillary lymphadenopathy was found. Ultrasonography (USG) diagnosis of juvenile breast hypertrophy associated with a giant fibroadenoma in right breast was made.

Trucut biopsy of right breast lump was taken and sent for histopathology that showed benign fibroepithelial lesion with features favoring fibroadenoma.

Patient was referred to endocrinology and plastic surgery department for appropriate management.

### Case # 2

Another 14-year female patient presented to our breast clinic with progressive massive bilateral breast enlargement for 8 months. In addition, patient complained of mastalgia, neck discomfort, and severe backache. She was facing psychological problems and social embarrassment as well. She attained thelarche at the age of 12 years and menarche at the age of 13 years. Her past medical and family history was unremarkable. She has not taken any medication yet.

On examination, she was a healthy patient with normal BMI of  $22.2 \text{ kg/m}^2$  (weight = 45 kg, height = 1.50 m). Breasts were asymmetrically enlarged and pendulous with widened areolas; right breast larger than left one (Figure 3). There were two palpable mobile lumps on right side.

Pressure sores were also found in the infra-mammary folds. No nipple discharge, skin discoloration, or itching was seen. No history of trauma was given by the patient.

Bilateral breast ultrasound showed diffusely thickened edematous breast parenchymal tissue bilaterally. In addition, two well-defined hypoechoic lesions were noted in upper outer quadrant of right breast, one measuring  $24 \times 15$  mm and other measuring  $21 \times 10$  mm. USG diagnosis of juvenile breast hypertrophy associated with two fibroadenomas in right breast was made. No significant axillary lymphadenopathy was found on either side.

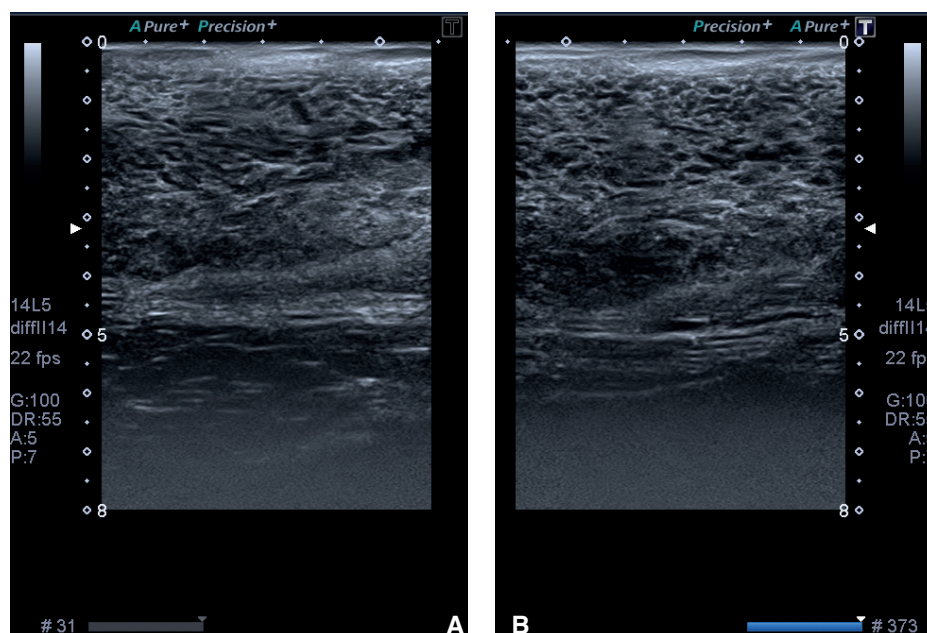
Trucut biopsy of right sided breast lumps followed by histopathology revealed these lesions to be benign fibroepithelial lesions with no evidence of atypia. Features favor fibroadenomas.

Patient was referred to endocrinology and plastic surgery department for further management.

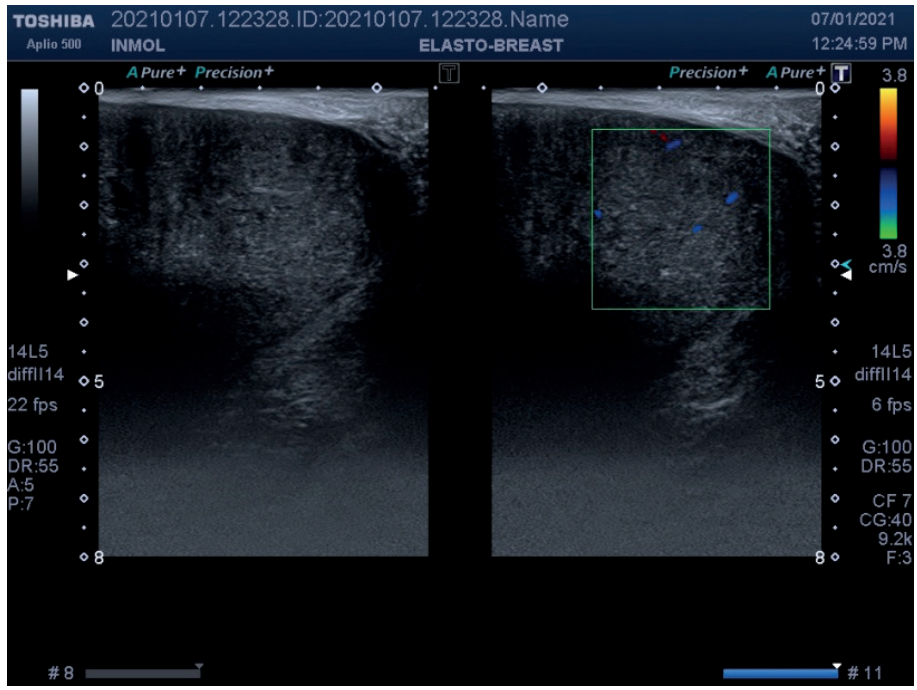
### Discussion

Juvenile breast hypertrophy is a rare and benign condition; however, its diagnosis is confirmed only after detailed patient history, thorough physical examination and exclusion of underlying conditions such as malignant or endocrine disorders. The condition is accompanied by physical and psychological consequences that negatively impact the quality of life so psychological monitoring plays a major role in disease management [1].

Several theories have been proposed regarding exact underlying etiology for juvenile breast hypertrophy. The popular theories include end-organ hypersensitivity to normal level of gonadal hormones, imbalanced endogenous hormone production, increased expression of



**Figure 1.** (A) (Right breast) and (B) (Left breast): ultrasonography shows diffusely thickened stromal and glandular tissue bilaterally.



**Figure 2.** Large well defined hypoechoic lesion occupying upper half of right breast having smooth margins showing moderate vascularity on color Doppler evaluation. Histopathology revealed it to be fibroadenoma.



**Figure 3.** Clinical photograph: there is massive asymmetric enlargement of both breasts which appear pendulous with widened areolas.

estrogen or progesterone receptors and excessive local estrogen production. Phosphatase and tensin homolog gene tumor suppressor gene mutation and deletion has also been postulated to have a link with precocious lobulo-alveolar development and excessive ductal branching [2]. Laboratory investigations including endocrinology profile rarely reveal abnormalities.

Breast imaging studies are particularly important in order to exclude tumors and occult pathologies. Mammography is difficult to interpret in young women owing to dense breast parenchyma and has a very limited

role in this respect. However, ultrasound has a very important role in this age group, and it is essentially needed for detection as well as characterization of any masses; if present in the enormously enlarged breasts in cases of juvenile breast hypertrophy. Ultrasound is required to differentiate between cystic/solid and benign/malignant breast lesions. Ultrasound can also provide image guidance for percutaneous biopsy of focal lesions [7]. In both our reported cases ultrasound showed associated benign looking solid breast masses; one in first case and two in second one. These masses turned out to be fibroadenomas

on histopathology. The association of juvenile breast hypertrophy and fibroadenomas has not been discussed in the previous case reports. Magnetic resonance imaging (MRI) may be more helpful in delineating breast architecture and occult pathologies in indeterminate cases.

Differential diagnosis of juvenile breast hypertrophy includes giant fibroadenoma, phylloides tumor, lymphoma, and sarcomas.

Spontaneous resolution is rare and timely management is the most challenging aspect. Treatment options include surgical management and medical therapy (preoperatively, postoperatively, or alone) [8]. First line option is reduction mammoplasty with free nipple graft or pedicle-based technique. This is followed by mastectomy and implant reconstruction in cases of recurrence. Of reduction mammoplasty techniques, free nipple graft technique has comparatively lesser chances of recurrence. But it must be delayed until full breast development has been achieved as surgery in active growth phase can lead to recurrence [6]. Free nipple grafting however has certain drawbacks including loss of lactation, graft failure, variable return of sensation and contractility of the nipple, and pigmentary changes of the nipple-areolar complex. Therefore, it is essential to counsel the patient and her family members about the limitations of this procedure [3].

Medical management include hormone modulators, for example; tamoxifen, dydrogesterone, medroxyprogesterone (Depo-provera), bromocriptine, and danazol. Most of the proposed theories regarding etiology of Juvenile breast hypertrophy (JBH) revolve around the estrogen imbalance. So tamoxifen, being an estrogen receptor modulator, can be a useful adjunct to surgical management despite normal endocrinology profile [1]. Use of tamoxifen in preoperative period followed by reduction surgery, gives stable post operative results in younger breasts JBH is prone to recurrence [9]. Some studies also show that a combination of reduction mammoplasty and “adjuvant” tamoxifen therapy can eliminate the need for repeated surgeries in young patients [1]. Furthermore, in the experienced clinical setups, tamoxifen therapy can become an alternative to surgical reconstruction during the brisk growth phase of the disease [10].

However, there are no evidence-based recommendations regarding the timing and dosage of these hormone modulators. Higher doses should be used with extreme caution. For example, side effects of tamoxifen include endometrial hyperplasia, venous thromboembolism, hot flashes, and bone density changes [2].

## Conclusion

Juvenile breast hypertrophy is a disturbing cosmetic problem. Early diagnosis and timely management can improve physical and psychological outcomes. However, breast imaging studies including ultrasound and MRI result in

non-specific imaging findings, and thus remain mostly non-conclusive. They are of value in detecting occult masses and image guided biopsies. A combination of reduction mammoplasty and tamoxifen therapy can eliminate the need for repeated surgeries in young girls.

### What is new?

Juvenile breast hypertrophy is a rare and benign condition; however, its diagnosis is confirmed only after detailed patient history, thorough physical examination and exclusion of underlying conditions such as malignant or endocrine disorders. It is a rare condition, only 65 cases were reported.

### List of Abbreviations

BMI      Body mass index  
MRI      Magnetic resonance imaging

### Conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

### Funding

No funding was obtained for this study from any source.

### Consent for publication

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

### Ethical approval

Ethical approval for the publication of this case report was obtained from the institutional review board. Ethical approval for the article was taken from the institutional review board on 19.03.2021 vide No. INMOL/PA/(03)2021.

### Author details

Rafia Shahzad<sup>1</sup>, Tooba Anjum<sup>1</sup>, Abu Bakar Shahid<sup>2</sup>

1. Department of Radiology, INMOL Hospital, Lahore, Pakistan
2. Department of Oncology, INMOL Hospital, Lahore, Pakistan

### References

1. Bianchi de Aguiar B, Santos Silva R, Costa C, Castro-Correia C, Fontoura M. Juvenile breast hypertrophy. *Endokrynol Pol*. 2020;71(2):202–3. <https://doi.org/10.5603/EP.a2019.0063>
2. Hisham A, Abd Latib M, Basiron N. Juvenile breast hypertrophy: a successful breast reduction of 14.9% body weight without recurrence in a 5-year follow-up. *Case Rep Surg*. 2017;2017:3491012. <https://doi.org/10.1155/2017/3491012>
3. Pokhrel B, Gautam S, Sharma S, Pokhrel NB, Bhatta NC, Rayamajhi S, et al. Virginal breast hypertrophy in a 14-year-old girl: a case report. *Clin Case Rep*. 2020;9(1):198–202. <https://doi.org/10.1002/ccr3.3498>
4. Hoppe IC, Patel PP, Singer-Granick CJ, Granick MS. Virginal mammary hypertrophy: a meta-analysis and treatment algorithm. *Plast Reconstr Surg*. 2011;127(6):2224–31. <https://doi.org/10.1097/PRS.0b013e3182131bd1>
5. Junita D, Wikanta ER. Giant breast hypertrophy in juvenile: a rare case. *Indones J Cancer*. 2020;14(2):60–3. <https://doi.org/10.33371/ijoc.v14i2.700>

6. Wolfswinkel EM, Lemaine V, Weathers WM, Chike-Obi CJ, Xue AS, Heller L. Hyperplastic breast anomalies in the female adolescent breast. *Semin Plast Surg*. 2013;27(1):49–55. <https://doi.org/10.1055/s-0033-1347167>
7. Park JY, Kim SH, Jung NY, Kang BJ, Lee AW, Jin MS. A case report of juvenile hypertrophy of the breast in a 15-year-old girl: presented with asymmetric breast enlargement and a focal mass-like lesion. *Investig Magn Reson Imaging*. 2019;23(2):175–8. <https://doi.org/10.13104/imri.2019.23.2.175>
8. Karagüzel G, Bilen S, Karaçal N, Yıldız K, Livaoğlu M. Virginal breast hypertrophy: different presentations of 2 cases and the role of tamoxifen as an adjuvant therapy. *J Pediatr Adolesc Gynecol*. 2016;29(5):e71–4. <https://doi.org/10.1016/j.jpag.2016.03.008>
9. Baker SB, Burkey BA, Thornton P, LaRossa D. Juvenile gigantomastia: presentation of four cases and review of the literature. *Ann Plast Surg*. 2001;46(5):517–25. <https://doi.org/10.1097/0000637-200105000-00011>
10. Demir K, Unuvar T, Eren S, Abaci A, Bober E. Tamoxifen as first-line treatment in a premenarchal girl with juvenile breast hypertrophy. *J Pediatr Adolesc Gynecol*. 2010;23(5):e133–6. <https://doi.org/10.1016/j.jpag.2009.11.003>

### Summary of the case

1	<b>Patients (gender, age)</b>	Females (13 and 14 years old)
2	<b>Final diagnosis</b>	Juvenile breast hypertrophy
3	<b>Symptoms</b>	Case 1: Bilateral breast enlargement and palpable right sided breast lump for 1 year. Case 2: Progressive massive bilateral breast enlargement for 8 months.
4	<b>Medications</b>	No medication
5	<b>Clinical procedure</b>	Bilateral breast ultrasound core biopsies of breast masses
6	<b>Specialty</b>	Diagnostic radiology