

A study of Bone Health Index (BHI) in girls with Turners Syndrome

Carley Frerichs¹, Carly Jenkinson², Ann Povall¹, Poonam Dharmaraj¹, Laurence Abernethy¹, Urmi Das¹, Renuka Ramakrishnan¹, Senthil Senniappan¹, Mohammed Didi¹, Jo Blair¹

¹Alder Hey Children's Hospital, Department of Endocrinology, Liverpool, United Kingdom

²Medical Student, University of Liverpool, Liverpool, United Kingdom

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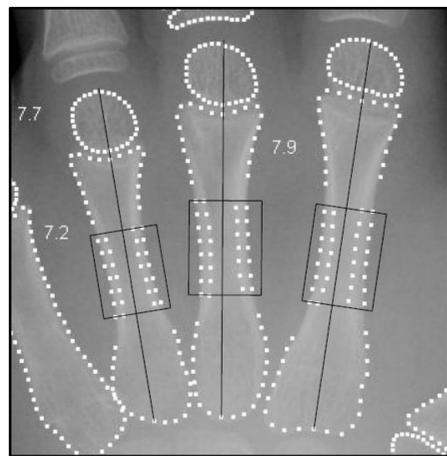
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Introduction

Turners Syndrome (TS) is associated with osteoporosis in later life. 'BoneXpert' has enabled the automated assessment of bone age (BA) and Bone Health Index (BHI).

BHI is a computer-generated measurement of the cortical thickness of the second, third and fourth metacarpal joints (Figure 1). Metacarpal length and width are also included in the calculation to take into account variations in stature during growth. This is seen as an accurate indicator of bone health and of the likely risk of fracture. BoneXpert also produces a standard deviation score for BHI (BHI-SDS) relative to the scores for a healthy cohort of children of the same BA^{1,2,3}. Strong correlations between BoneXpert BHI and dual-energy x-ray absorptiometry and peripheral quantitative computed CT measurements are reported.

Figure 1: Measurements for BHI¹



The automated method of assessment eliminates human error involved in taking, interpreting readings as well as reader variability implicit in taking and comparing multiple X-ray readings by the traditional method¹.

Objective

To investigate the relationship between BHI-SDS and hormone treatment in a cohort of girls with TS.

Methods

All patients in our database with TS were reviewed. BA and BHI data analysed against age and therapy received. If patients had multiple readings over time they were grouped according to therapy at time of BHI analysis.

Results

Data were available for 28/61 patients and 57 x-rays were analysed. All results reported median (range). The BHI-SDS of the 57 x-rays was -0.6 (-3.4 to 2.8).

BHI SDS according to endocrine therapies are described in Table 1.

	No treatment (n=13)	Growth Hormone (GH) (n=21)	GH and oestrogen (n=22)	Oestrogen (after GH) (n=1)
Age (yrs)	9.2 (6.3-15.9)	11.6 (6.3-17.3)	15.5 (11.2-18.8)	15.6
TW2 BA	9.2 (6.4-13.7)	11.08 (5.1-15.4)	13.1 (9.4-14.7)	15.7
BHI-SDS	-1.8 (-3.4-0.1)	0.4 (-2.4-2.8)	-0.8 (-2.5-0.7)	-1.5

BHI SDS was significantly higher in girls treated with GH compared to those with no treatment ($p=0.004$) or those treated with GH + oestrogen ($p=0.01$).

Conclusion

This is the first study to describe BHI-SD in TS. BHI-SDS seems to change over time. BHI was higher in girls treated with GH alone, compared to those with no treatment or those treated with GH + oestrogen. This may reflect inadequate oestrogen replacement, or an intrinsic effect of TS on bone health which becomes more apparent over time.

BHI-SDS may be a useful marker for future research studies looking at the optimal treatment and timing of treatments in girls with TS, and may have a role for monitoring bone health in girls with TS. A larger cohort study is required to explore these observations further.

References

1. BoneXpert <http://www.bonexpert.com/>
2. Thodberg HH, Kreiborg S, Juul A, Pedersen KD: **The BoneXpert Method for Automated Determination of Skeletal Maturity** *EEE Trans Medical Imaging*; 2009; 28(1): 52-66
3. Thodberg HH, van Rijn R, Tanaka T, Martin DD, Kreiborg S. **A paediatric bone index derived by automated radiogrammetry**, *Osteoporosis International* 2009; 21 (8):1391-1400

Email: Jo.Blair@Alderhey.nhs.uk

