Case Report

Klippel Feil Syndrome presenting with tricuspid regurgitation and cardiopulmonary distress secondary to dysplastic thoracic cage and spine: A case report

Sidra Naz a, b, Ammu Thampi Susheela c, Vikash Jaiswal d, e, *, Jon Quinonez e, Srushti Patel f, Abhigan Babu Shrestha g

a University of Health Science, Lahore, Pakistan
b The University of Texas, MD Anderson Cancer Center, Texas, USA
c Department of Internal Medicine, Loyola-MacNeal Hospital, IL, USA
d AMA School of Medicine, Makati, Philippines
e Larkin Community Hospital, South Miami, FL, USA
f Gujarat Medical Education and Research Society (GMERS) Medical College, India
g M Abdur Rahim Medical College, Dinajpur, Bangladesh

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ABSTRACT

Background: Klippel Feil syndrome is a rare multifactorial disease that occurs due to a combination of genetic and environmental factors. It is a complex disease that requires lifelong treatment by multidisciplinary teams.

Case report: We present a case of a 15-year-old girl who presented with fever and shortness of breath and was found to have Klippel Feil Syndrome with a unique presentation of tricuspid regurgitation with cardiopulmonary distress secondary to dysplastic thoracic cage and spine.

Discussion: Patients with Klippel feil syndrome are at increased risk for infection and cardiovascular problems. Proper surgical and medical management are required for patient wellbeing. Delay in diagnosis and management can be fatal with worse outcome.

1. Background

Klippel Feil syndrome is a rare disorder characterized by a triad of two or more cervical vertebrae (above or below C3) fusion, a short neck, and a low hairline. We present an interesting case of a 15 year -year-old girl with Klippel Feil Syndrome that presented with cardiopulmonary distress secondary to dysplastic thoracic cage and spine.

1.1. Method

SCARE 2020 guideline.

2. Case presentation

A 15-year-old female with a history of having on and off chest infection and long term dyspnea presented to a local hospital for evaluation of fever and shortness of breath in pediatrics department. The shortness of breath was acute onset, getting worse with exertion, and unchanged at rest which is lasted for days.

Her mother had a normal vaginal delivery at 38-weeks gestational age, received a tetanus vaccine during her pregnancy, but did not take folic acid. At the time of the delivery, she weighed 3 kg and was breastfed for 6 months. She was able to meet some milestones (fine motor, language, social), but exhibited delayed gross motor skills. Her family history consisted of asthma, diabetes mellitus, hypertension, and tuberculosis. She had 6 other siblings of which two died immediately after birth due to lower limb/spinal anomalies.

On presentation to the emergency department, her atrial blood gas (ABG) at admission was Ph = 7.31, PCO2 = 60mmhg, PO2 = 62mmhg, HCO3 = 21.66, base deficit = -4.4, there vitals were: weight – 22 kg, heart rate – 110 bpm, temp – 99.6° F, Oxygen saturation – 92% via an oxygen mask, respiratory rate – 38/min. A physical examination
revealed a young female in acute distress. Other important physical examination findings that were high arched palate, webbed fingers, kyphoscoliosis, dental overcrowding, torticollis, a short-webbed neck with low hairline, rocker-bottom feet, and a deformed dysplastic thoracic cage. Fig. 1 show a physical representation of the patient at the time of her initial physical examination. Genetic testing was not done due to lack of resource in the primary care setting. The patient underwent entire body X-Ray of which demonstrated several findings that included a deformed dysplastic thoracic cage with crowded left-sided ribs, an enlarged cardiogenic shadow with left shift due to dysplasia, kyphoscoliosis, a short neck, complex skeletal dysplasia with concern for Kippel-fiel syndrome, and a high-level scapula (left) near the cervical spine. Fig. 2 show the patient’s radiography findings. She was admitted for further management. She underwent echocardiography which demonstrated severe tricuspid regurgitation with a dilated right ventricle and pulmonary hypertension (Fig. 3), and pulmonary hypertension. Orthopaedic and cardiologist opinions were taken related to the case and management.

The differential diagnosis for our patient with fever and dyspnea included pneumonia, pericarditis, pulmonary embolism was ruled out by ECHO, discitis which was ruled out by Xray, ankylosing ankyllosing spondylitis which was ruled out by x-ray and Juvenile rheumatoid arthritis which was ruled out by serology.

After admission, continues Bipap machine was used for oxygen supply and intravenous ceftriaxone (1 mg BD), paracetamol (50 mg stat once), and furosemide (20 mg stat once) started along with nebulized salbutamol, oral spironide (20 mg BD), sildenafil (50 mg 1/2 tab BD), and injectable ondansetron (130 IU). Her ABG at discharge was: 

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\begin{align*}
\text{Ph} &= 7.4, \\
\text{PCO}_2 &= 50\text{mmhg}, \\
\text{PO}_2 &= 75\text{mmhg}, \\
\text{HCO}_3 &= 23, \\
\text{base deficit} &= -3.
\end{align*}
\]

After appropriate management was initiated, her symptoms improved such that she was discharged and a referral for orthopaedic surgeons was recommended. Although patient was not able to undergo for surgery due to lack of financial support.

3. Discussion

Klippel Feil syndrome is a rare multifactorial disease that occurs due to a combination of genetic and environmental factors. It is a complex disease that requires lifelong treatment by multidisciplinary teams [1]. It was first reported in 1912 by Maurice Kleppel and Andre Feil independently and was found to have an incidence rate of 1 in 40,000–42,000 with more prevalence in females [2]. Andre Feil classified the disease into three categories (I-III). Type 1 is the cervical spinal fusion where elements of several vertebrae are incorporated into a single block; type 2 has a failure of complete segmentation at only 1 or 2 cervical levels including occipito-atlantal fusion; and, type 3 is a type 1 or 2 fusion with coexisting segmental errors in the lower dorsal or lumbar spine [3].

The incidence of Klippel Feil syndrome (KFS) is sporadic. However, genetic mutations in GDF6, GDF3 (on chromosome 12p13), which is autosomal dominant, and MEOX1 (on chromosome 17q21), which is an autosomal recessive, inheritance has have been reported in Klippel Feil syndrome cases. These genes code for the bone morphogenetic protein family [1,2]. Our patient did not have a significant history of the same or any structural or genetic diseases in the family. Klippel Feil syndrome causes abnormal fusion of at least two cervical vertebrae in the spine [3]. They present with a short neck, low hairline at the back of the line, raised scapula (sprengel’s deformity) and restricted movement of the upper spine, facial asymmetry most of which was present in our patient. The structural deformities make them very prone to infections.

Subclavian artery supply disruption sequence is a group of birth defects that includes Klippel Feil Syndrome early embryonic blood supply [4].

People with Klippel Feil Syndrome are at very high risk of severe spine injury as well as spinal stenosis [4]. Disease is diagnosed with the help of clinical examination, symptoms, and imaging studies which confirmed the case of our patient.

The syndrome can also present with a variety of other syndromes such as fetal alcohol syndrome, Goldenhar syndrome, anomalies of extremities, syringomymelia, genitourinary tract including renal aplasia and horse-shoe kidney [5]. Associated anomalies occur in the auditory canal, neural axis, cardio-vascular system [5]. Cardiac anomalies comprise 4–5% of the cases [4]. Several congenital heart diseases has have also been found in Klippel Feil Syndrome including cor tia triatum, coarctation of the aorta, atrial and ventricular septal defects, transposition of great arteries, situs inversus, vertebral artery abnormalities, sinus of valsalva Valsalva of an aneurysm, and anonymous pulmonary venous return leading to pulmonary hypertension and Eisenmenger syndrome [6]. Complete heart block has also been reported in a case report by Elumalai et al. [6] Some of the complications of this disorder is Stroke Adam attack and sudden death [5,6]. Transesophageal echo also poses significant challenges due to the structural deformity and a viable alternative would be epicardial echocardiography. Tricuspid regurgitation and right ventricular dilation are less common features of this disorder which was characteristic of our patient and likely could have contributed to the dyspnea.

Klippel Feil syndrome patients are also noted to have jaw abnormalities including mandibular hyperplasia and cleft palate that has been associated with upper airway obstruction, sleep apnea, difficult intubation, ventilation, and spinal nerve injury due to manipulation and positioning from intubation [7]. Use of awake nasal or oral fiberoptic intubation, while maintaining spontaneous ventilation is recommended [7]. Extubation is also recommended on a fully awake patient with protective airway reflexes [7]. This work has been reported in line with the SCARE 2020 criteria [8].

Ethical approval

Not required.

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Author contribution

VJ, SN, JQ, AS has written the manuscript. ABS, SP, and VJ performed critical edits of the draft, and prepared the final version of this manuscript which was approved by all authors.
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Guarantor

Dr Sidra Naz
sidrasss582@gmail.com

Informed consent

Written informed consent has been taken from the Father of patient for this case and which can be made available upon reasonable request from corresponding author.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Declaration of competing interest

None.

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Fig. 2. Total body radiography showing deformity in the skeleton.

Fig. 3. Echocardiographic findings showing severe Tricuspid regurgitation.
References

[1] Klippel Feil syndrome, Genetic and Rare Diseases Information Center (GARD) – an NCATS Program [Internet], Nih.Gov, 2020 [cited 2021 Sep 9]. Available from: https://rarediseases.info.nih.gov/diseases/10280/klippel-feil-syndrome.

[2] R. Bejiqi, R. Retkoceri, H. Bejiqi, N. Zeka, Klippel - feil syndrome associated with congenital heart disease presentation of cases and a review of the current literature [Internet], Open Access Macedonian J. Med. Sci. 3 (1) (2015), Feb 11 [cited 2021 Sep 9]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4877771/, 129–34. Available from:.

[3] J.J. Nora, Klippel-Feil Syndrome with congenital heart disease [Internet], Arch. Pediatr. Adolesc. Med. (1961). Dec 1 [cited 2021 Sep 9];102(6):858. Available from: https://jamanetwork.com/journals/jamapediatrics/article-abstract/500008.

[4] Klippel–Feil syndrome, A Very Unusual Cause of Severe Aortic Regurgitation: EBSCOhost [Internet], Luh.org, 2019 [cited 2021 Sep 9]. Available from: https://web-a-ebcoholic.com.archer.luh.org/ehost/pdfviewer/pdfviewer?vid=1&sid=e0627ac0-996b-444f-822f-67bda4d0b684%40sessionmgr4008.

[5] R.S. Elumalai, M.S. Nainar, K. Vaidyanathan, G. Somasundaram, G. Balasubramaniam, Congenital complete heart block in Klippel-Feil syndrome [Internet], Asian Cardiovasc. Thorac. Ann. (2013 Apr) [cited 2021 Sep 9];21(2): 199–201. Available from: https://pubmed.ncbi.nlm.nih.gov/24352621/.

[6] R.H. Falk, J. Mackinnon, Klippel-Feil syndrome associated with aortic coarctation [Internet], Heart (1976). Nov 1 [cited 2021 Sep 9];38(11):1220–1. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC483160/?page=2.

[7] J.N. Bavinck, D.D. Weaver, Subclavian artery supply disturbance sequence: hypothesis of a vascular etiology for Poland, Klippel-Feil, and Mobius Anomalies [Internet], Am. J. Med. Genet. (1986). Apr 1 [cited 2021 Sep 15];23(4):903–18. Available from: https://pubmed.ncbi.nlm.nih.gov/3008556/.

[8] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.