Case report

A forensic case of sacralization of the sixth lumbar vertebra in skeletal remains.

Tanaka N[1], Kinoshita H[2], Jamal M[3], Tsutsui K[4], Motomura H[5], Ameno K[6]

Abstract

Lumbosacral transitional vertebrae (LSTVs) are a common congenital anomaly of the spine. In the present case, we observed LSTVs in the excessive (sixth lumbar) vertebra. In forensic practice, this anomaly may be useful for personal identification of skeletal remains.

Key Words: lumbosacral transitional vertebrae (LSTVs), skeletal remains, personal identification

Introduction

Personal identification is an essential subject in forensic medicine [1,2]. Morphological characteristics such as healed fractures, bone disease, congenital defects and prosthesis provide useful information for personal identification in case of skeletal remains[1-6]. Here we describe lumbosacral transitional vertebrae (LSTVs), a congenital anomaly in the part of spine[7], in relation to forensic skeletal remains.

Case History:

Almost completely skeletonized human remains were found in a house, where an aged person had lived alone. Anthropological findings led us to determine that the deceased was a male between 60 to 80 years of age. The stature of the victim, calculated from the length of the femoral bones, was approximately 160-165cm, and the postmortem interval was estimated at approximately 2-4 years. No dental work, healed fractures, surgical intervention or recent injuries were recognized. The skeleton had extra lumbar vertebrae and sacralization of a sixth lumbar vertebra (Type IIB) was observed in the spine as a characteristic finding (Figure 1).

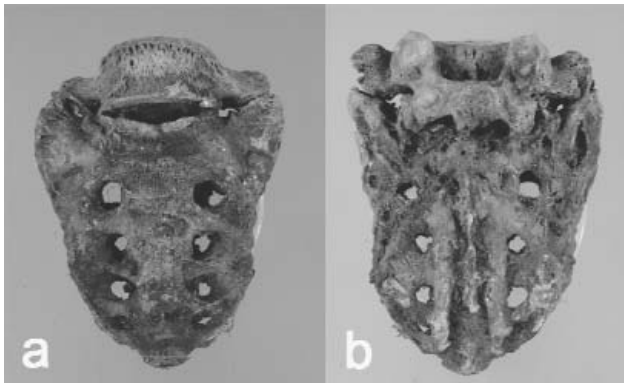

Figure 1. Anterior (a) and posterior (b) views of the sacralization of the sixth lumbar vertebra in the present case.

Subsequent DNA examination using AmpF*l*STR® Identifiler® PCR Amplification Kit (Applied Biosystems, USA) identified the remains as the resident of this house. His age was within the esti-

1. Naoko Tanaka, Department of Forensic Medicine, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan.
2. Hiroshi Kinoshita, Department of Forensic Medicine, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan.
3. Mostofa Jamal, Department of Forensic Medicine, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan.
4. Kunihiko Tsutsui, Health Sciences, School of Nursing, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan.
5. Hiroyuki Motomura, Forensic Science Laboratory, Hyogo Prefectural Police Headquarters, 4-1, Shimoyamate-dori 5-chome, Chuo-ku, Kobe, 650-8510, Japan.
6. Kiyoshi Ameno, Department of Forensic Medicine, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan.

Corresponds to: Dr. H. Kinoshita, Department of Forensic Medicine, Faculty of Medicine, Kagawa University, 1750-1, Miki, Kita, Kagawa, 761-0793, Japan. ***E-mail:*** kinochin@med.kagawa-u.ac.jp

mated range.

Discussion

Personal identification was performed by DNA typing in the present case. LSTVs are common congenital anomalies, and are defined as either sacralization of the lowest lumbar segment or lumbarization of most superior sacral segment of the spine[7]. Four types of LSTVs have been classified on the basis of morphological characteristics[8]. The frequency of occurrence of LSTVs varies in different human population groups, and it observed in 4-24% of the general population[9] and in 15-18.1% of the Japanese population[10,11]. However, as the frequency of conversion of LSTVs into an excessive vertebra is 1.6%[12], its characteristic findings may be useful for personal identification.

It has been previously reported that low back pain associated with LSTVs is called Bertolotti's syndrome[13]. Although the relationship between LSTVs and low back pain remains controversial[14], it has been reported that the incident of LSTVs in patient with low back pain is higher than that of the general population[9]. The person who has low back pain seems to seek medical examination, and they may have a higher opportunity to take X-ray films of the spinal region[15].

Comparisons of radiological morphological features between antemortem and postmortem X-ray films have been performed for personal identification in case of skeletal remains[16-20]. The morphological characteristic findings of spinal region may also provide useful information, if antemortem lumbosacral X-ray films was available in the present case.

References

1. Knight B. Forensic Pathology. 2nd Edition. London: Arnold, 1996; 95-132. PMid:9414393

2. Jackson ARW, Jackson JM. Forensic Science. *Essex: Pearson Education Limited* 2004; 339-349.

3. Ohshima T, Maeda H, Takayasu T, Zhu B, Lin Z, Nishigami J, Nagano T. Three cases of personal identification on cadavers with advanced postmortem changes. *Res Pract Forens Med* 1991; **34**: 299-305.

4. Aoki Y, Nata M, Hashiyada M, Saigusa K, Nakayama Y. Five cases of positive identification by means of implanted medical equipment. *Res Pract Forens Med* 1998; **41**: 193-198.

5. Kinoshita H, Motomura H, Kasuda S, Nishiguchi M, Matsui K, Takahashi M, Ouchi H, Minami T, Yamamura T, Otsu N, Yoshida S, Adachi N, Ohta T, Hishida S. Positive identification facilitated by implanted metallic plate and screws. *Soud Lek* 2009; **54**: 16. PMid:19534396

6. Kinoshita H, Tanaka N, Ohi T, Jamal M, Ohkubo E, Ameno K. Prior surgical intervention of the bone; useful finding for the examination of the skeletal remains. *Bangladesh J Med Sci* 2010; **9**: 93-94.

7. Konin GP, Walz DM. Lumbosacral transitional vertebrae: classification, imaging findings, and clinical relevance. *AJNR Am J Neuroradiol* 2010; **10**: 1778-1786.http://dx.doi.org/10.3174/ajnr.A2036PMid:20203111

8. Castellvi AE, Goldstein LA, Chan DPK. Lumbosacral transitional vertebrae and their relationship with lumbar extradural defects. *Spine* 1984; **9**: 493-495.http://dx.doi.org/10.1097/00007632-198407000-00014PMid:6495013

9. Delport EG, Cucuzzella TR, Kim N, Marley J, Pruitt C, Delport AG. Lumbosacral transitional vertebrae: incidence in a consecutive patient series. *Pain Physician* 2006; **9**: 53-56. PMid:16700281

10. Sato T, Akita K. (ed) Anatomic variations in Japanese. *Tokyo: University of Tokyo Press* 2000; **8**.

11. Amako T. (ed) Jinnaka's Textbook of Orthopedic Surgery (20th eds). *Tokyo: Nanzando* 1978; 603-605.

12. Takeuchi S. A study on the number of the Japanese vertebrae. *Tokyo Jikeikai Medical Journal* 1980; **95**: 584-597.

13. Quinlan JF, Duke D, Eustace S. Bertolotti's syndrome. A cause of back pain in young people. *J Bone Joint Surg Br* 2006; **88**: 1183-1186. http://dx.doi.org/10.1302/0301-620X.88B9.17211PMid:16943469

14. Apazidis A, Ricart PA, Diefenbach CM, Spivak JM. The prevalence of transitional vertebrae in the lumbar spine. *Spine J* 2011; **11**: 858-862.http://dx.doi.org/10.1016/j.spinee.2011.08.005PMid:21951610

15. Kanchan T, Shetty M, Nagesh KR, Menezes RG. Lumbosacral transitional vertebra: clinical and forensic implications. *Singapore Med J* 2009; **50**: e85-e87.PMid:19296021

16. Ikeda N, Umetsu K, Harada A, Suzuki T. Radiologic identification of human skeletal remains: a acse report. *Nihon Hoigaku Zasshi* 1987; **41**: 270-273.PMid:3682300

17. Owsley DW, Mann RW. Positive personal identity of human skeletonized remains using abdominal and pelvic radiographs. *J Forensic Sci* 1992; **37**: 332-336.PMid:1545209

18. Gunji H, Hiraiwa K. Radiographic identification of unknown human remains with a bone island in the sacrum. *Res Pract Forens Med* 1992; **35**: 297-300.

19. Sakaihara M, Terazawa K. A case of positive personal identity of skeletonized remains using lumbar radiograph. *Hokkaido Igaku Zasshi* 2002; **77**: 157-160. PMid:11968851

20. Kahana T, Goldin L, Hiss J. Personal identification based on radiographic vertebral features. *Am J Forensic Med Pathol* 2002; **23**: 36-41. http://dx.doi.org/10.1097/00000433-200203000-00007 PMid:11953491