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Research Article

FUSION AT XIPHI-STERNAL JOINT IN LIVING POPULATION THROUGH LATERAL CHEST DIGITAL RADIOGRAPH

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ABSTRACT
Medicolegal autopsy is one of the important jobs of forensic experts dealing in medicolegal work. Medicolegal autopsy is done in all the unnatural cases of human death. However, medicolegal autopsy in unknown cases, putrefied cases and murder cases creates a grave challenge to forensic experts. Forensic experts are frequently asked to give age and sex in these cases. During autopsy, we study fusion at various joints and sutures like skull sutures, fusion in sternal parts and fusion of inner end of clavicle. We rely on the data available in the books and few articles. So, the purpose of our study is to estimate age from xiphisternal joint by digital radiographs. We had taken the digital Lateral radiograph of the chest in the available population and fusion at xiphisternal joint was studied. The average age of fusion of xiphisternal joint comes out to be 43 years.

Keywords: *Age Determination, Autopsy, Xiphisternal Joint, Putrefied, Forensic Experts*

INTRODUCTION
Medicolegal autopsy is one of the important jobs of forensic experts dealing in medicolegal work. Medicolegal autopsy is done in all the unnatural cases of human death. However, medicolegal autopsy in unknown cases, putrefied cases and murder cases creates a grave challenge to forensic experts. Forensic experts are frequently asked to give age and sex in these cases. During autopsy, we study fusion at various joints and sutures like skull sutures, fusion in sternal parts and fusion of inner end of clavicle. In living also forensic experts are frequently asked for giving age in medicolegal cases like rape, kidnapping and pension cases of senior citizen. The data records for age is still not up to mark especially in the middle to old age population. We rely for giving age from fusion of bones and sutures based on available literature which is dominating the population from the western world.

There is also different opinion for age in respect of xiphisternal joint. Few authors opined that xiphoid fuses with the mesosternum at about or around 40 years of age (Glaister and Rentoul, 1966; Krogman,1962; Mathiharan and Patnaik, 2006; Parikh, 2006; Reddy, 2008). Xiphisternal joint is also a symphysis, at 40th year of age it may transform to a synostosis or remain unchanged even in old age (Gatzoulis and Standring, 2008). Few authors mentioned that the xiphisternal joint fusion starts after the age of 40 and complete by 50 years of age (Gautam *et al.*, 2003).

So, the purpose of our study is to estimate age from xiphisternal joint by digital radiographs in living population of our area. We had taken the digital Lateral radiograph of the chest in the available population and fusion at xiphisternal joint was studied. So, the cases or persons who are not suffering from any disease related to chest bones and whose exact date of birth is known are considered for the study.

MATERIALS AND METHODS
The present study comprised of 108 subjects between the age group of 22-85 years. Only those cases were considered where proof of exact date of birth was available as per date of birth certificate. The cases showing any disease or damage in respect to anterior chest wall were not considered. Lateral Digital radiographs of chest were taken, reported and analysed. The X-ray films which show complete fusion at

xiphisternal joint were labelled as positive or fused and all other cases showing partial and non fusion were labelled as negative or unfused. The present study is also compared with earlier studies.

RESULTS AND DISCUSSION

Result

The total of 108 cases was studied. 5 cases were discarded because of lack of good x-ray exposure or breast overshadowing and doubt of date of birth. The studied cases were divided into age groups as follows: -

- 20 – 30 years
- 31 – 40 years
- 41 – 50 years
- 51 – 60 years
- 61 – 70 years
- 71 – above years

The sex wise distribution of cases is shown in Table 1.

Table 1: Showing Sex Wise Distribution of Cases

Age Group	Total	Male	Female
21-30	5	4	1
31-40	32	24	8
41-50	20	8	12
51-60	21	14	7
61-70	17	13	4
71-above	8	7	1
Total	103	70	33

Discussion

It is observed in the present study that in age group of 21 to 30 years, there is 100 % non fusion at xiphisternal joint. The fusion is seen to extent of 62.5 % in age group of 31 to 40 years (Table 2). The earliest age of fusion of the joint is observed at the age of 31 years in males and 34 years in females, since there is no female case in age 31 to 33 years individually. After 41 years, the percentage of fusion remained above 85 % throughout (Table 2).

The non fusion of xiphisternal joint is seen at the age of 65 years. However, in the age group of 61-70 years the fusion percentage is 94.12 % (Table 2).

Table 2: Showing Distribution of Cases According to Fusion and their Percentage

Age Group	Total	Fusion	% Fusion	Non Fusion	% NonFusion
21-30	5	0	0	5	100
31-40	32	20	62.5	12	37.5
41-50	20	18	90	2	10
51-60	21	18	85.71	3	14.29
61-70	17	16	94.12	1	5.88
71-above	8	8	100	0	100
Total	103	80		23	

Above 71 years, the current study is showing 100 % fusion at xiphisternal joint.

The average age of fusion of xiphisternal joint comes out to be 43 years which is comparable with previous studies (Garg *et al.,* 2011; Gatzoulis and Standring, 2008; Gaur *et al.,* 2010; Gautam *et al.,* 2003; Silajiya *et al.,* 2013; Wadhawan *et al.,* 2010).

The present study is compared with the study conducted by previous authors as shown in table 3.

Table 3: Showing Comparison of Study with Previous Studies by Various Authors

Author	Year	Location	Age of Onset (Years)	Age of Completed (Years)	Mean Age (Years)
Gautam et al	2003	Ahmedabad	31-35	Male 50, Female 50	-
Wadhawan et al	2010	New Delhi	Male & Female 31-35	-	Partial 35.42 Complete 55.95
Gaur et al	2010	Pune	31-35	>41	-
Garg et al	2011	Punjab	Male 36, Female 35	-	Male 50.04 Female 46.42
Silajiya et al	2011	Ahmedabad	-	Male 42, Female 44	-
Sethi et al (Present study)	2015-16	Patiala,	32	65 years	43 years

Figure 1 is showing Non fusion xiphisternal joint at 35 years. Figure 2 is showing fusion at xiphisternal joint at age of 40 years. Figure 3 is showing Non fusion xiphisternal joint even at 65 years of age.

Figure 1: Non Fusion Xiphisternal Joint at 35 Years

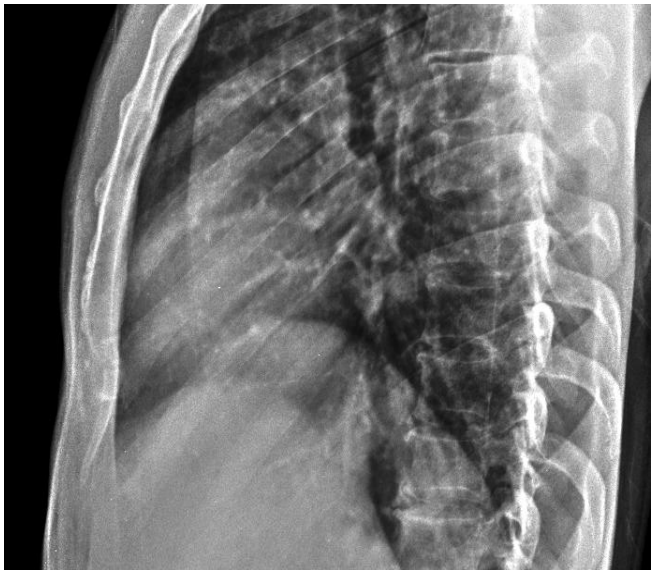

Figure 2: Showing Fusion at Xiphisternal Joint at Age of 40 Years

Conclusion

As per current study, fusion at xiphisternal joint was seen at the earliest at 31 years of age and this fusion is not seen even at the age of 65 years in an individual. This study is also showing wide variation.

So, it can be concluded that if we find fusion at the xiphisternal joint during autopsy, then, we can safely say that age of person is more than 31 years.

And if we did not find any fusion at xiphisternal joint during autopsy, then we can say that age is not above 65 years.

So, it is also suggested that we should explore other parameters to estimate the age of deceased.

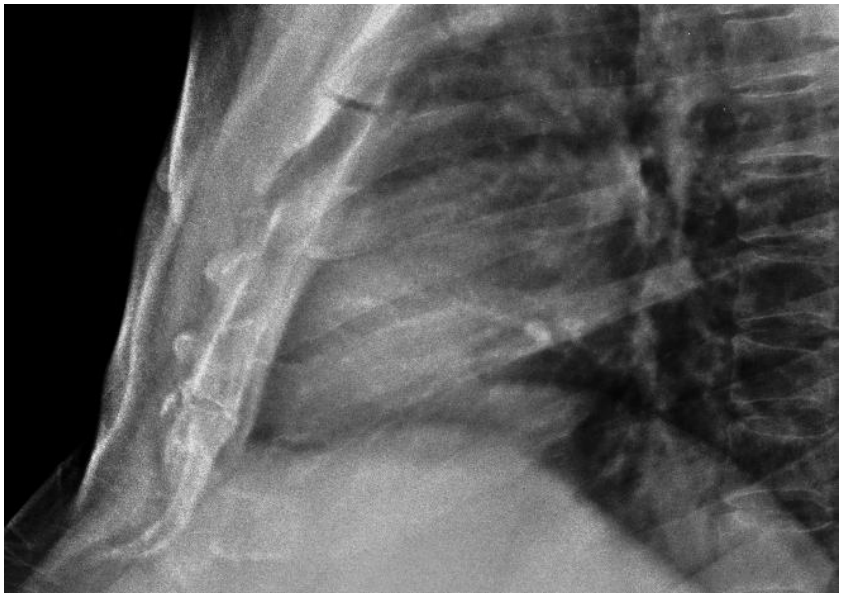

Figure 3: Shows Non Fusion Xiphisternal Joint at 65 Years

Conflict of Interest
None.

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