



Original communication

## Retrospective analysis of 319 hanging and strangulation cases between 2001 and 2014 in Shanghai



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### ABSTRACT

In this study, we retrospectively analyzed 141 cases of hanging and 178 cases of ligature strangulation recorded in the Shanghai Municipal Public Security Bureau between January 2001 and December 2014 to explore the characteristics of hanging and ligature strangulation and to supply a scientific reference for forensic pathology. Several significant differences between hanging and ligature strangulation were found. Hanging cases were mostly suicide, with some accidental cases. Strangulation cases were mostly homicide, with a few cases of suicide or sexual asphyxia. Male hanging was more common than female hanging, with a ratio of 5:2. However, there were more female than male strangulation cases, with a ratio of 13:5. The ligature marks in hanging cases were almost all of a “U” type and above the hyoid bone. The ligature marks in strangulation cases were almost always a closed circle, but the position varied. The most common vital reactions were subcutaneous hemorrhage, exfoliation and blister, which are strong evidence of antemortem injury. Hemorrhagic spots were found on the temporalis, scalp, chest and back in strangulation cases, but were rare in hanging cases. Hemorrhagic manifestations were most common in the sternocleidomastoid muscle in hanging cases, and in the sternohyoid and sternothyroid muscles in strangulation cases. Fractures occurred in only ~17% of victims. There are notable differences between hanging and ligature strangulation, which can help distinguish between these causes of death. These characteristics should be considered in forensic practice.

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## 1. Introduction

Shanghai, China, is one of the most populous cities in the world. By the end of 2014, the permanent resident population of Shanghai had reached 24 million.<sup>1</sup> Following any acts of crime in this city, the police quickly launch a crime scene investigation, and an autopsy is performed by the Shanghai Public Security Bureau (PSB) on victims of crime. If murder is ruled out, cases only undergo an external examination by the sub-district of the public security bureau, and the cases reports will not be recorded in the electronic database in the Public PSB of Shanghai. Only criminal cases and doubted criminal cases were recorded here. Case information that is recorded includes the crime scene investigation, the results of the

external examination, the autopsy reports and the toxicological analysis reports. The criminal cases were mostly consist of hemorrhagic shock or brain trauma, which is much more than mechanical asphyxia. Between January 2001 and December 2014, 783 mechanical asphyxia cases in Shanghai were recorded. Hanging and strangulation comprise the largest number of mechanical asphyxia. Both of them are caused by an interaction between the neck and a rope or something else similar. However, in forensic practice, many different factors influence the nature of such interactions, such as the sex and gender distribution and characteristics of the injury and fracture.<sup>2–4</sup> To investigate the pattern of strangulation cases and hanging cases, we conducted a retrospective analysis.

## 2. Methods

All of the cases in this study were come from Shanghai Municipal Public Security Bureau (PSB). We retrospectively analyzed 141

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cases of hanging and 178 cases of ligature strangulation recorded between January 2001 and December 2014. A detailed description of each case was recorded in the electronic database or record office of the bureau. The behavior involving the cases is following the Provisions on the Procedures for Handling Criminal Cases by Public Security Organs (2012 Revision).<sup>5</sup>

**3. Results**

**3.1. General statistics of the asphyxia cases**

In the 783 cases of asphyxia death, hanging cases accounted for 18.0% and strangulation cases accounted for 22.73%. The records revealed a decreasing trend in strangulation cases over this period (Fig. 1). Additionally, June and April were the months with the highest frequencies of strangulation cases and hanging cases, respectively (Fig. 2).

**3.2. Age and sex distribution**

The most frequently involved age group for all cases was the 30–39-year-old age group, with 83 (26.02%) cases followed by the 20–29-year-old age group, with 65 (20.38%) cases. Among the 141 hanging cases, 100 were male and 41 were female, with ages ranging from 12 to 79 years, in a ratio of 5:2. Among the 178 strangulation cases, 49 were male and 129 were female, with ages ranging from newborn to 93 years, in a ratio of 5:13. More females than males were strangled, although more males than females were victims of hanging. In this study, strangulation cases were often old and weak while hanging cases were often middle-aged males (Fig. 3).

**3.3. Nature of death**

Of the 141 hanging cases, 135 (95.74%) cases were suicide while 3 cases were sexual asphyxia and 3 cases were unknown, demonstrating that almost no hanging cases were an act of homicide. Additionally, 170 (95.51%) out of 178 strangulation cases were homicide, while 6 cases were suicide and 2 were sexual asphyxia (Table 1).

**3.4. Handling of cases**

External examination of the cadaver was carried out in all cases. An autopsy was performed in only 46 (32.62%) of the 141 hanging cases because the manner of death in the remaining hanging cases had been confirmed by the crime scene investigation. When murder was ruling out, autopsy was not carried out. This procedure follows the law of China: Provisions on the Procedures for

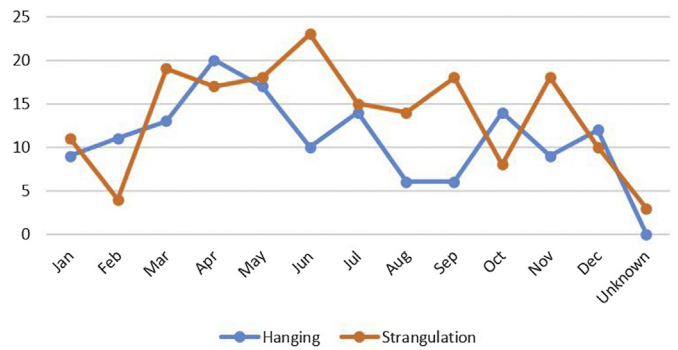


Fig. 2. Month distribution of the 319 cases.

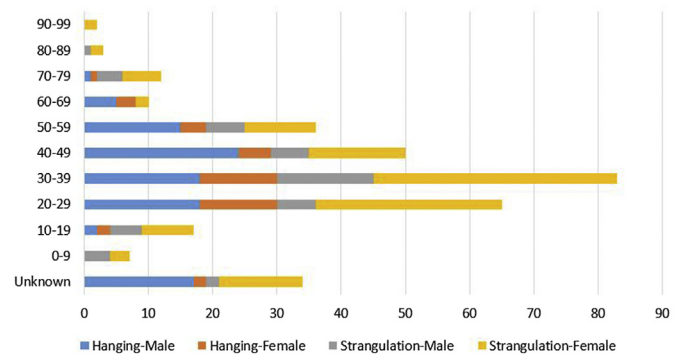


Fig. 3. Sex and age distribution of the 319 cases.

Handling Criminal Cases by Public Security Organs (2012 Revision).<sup>5</sup>

Of the 178 strangulation cases, an autopsy was performed in 171 cases, including 5 cases of a skeletonized body (Table 1).

**3.5. Manner of death**

None of the 141 hanging cases involved an additional manner of death, but 52 (29.21%) of the strangulation cases were found with evidence of injury by manual strangulation, such as fingerprints and handprints. Additionally, some cases were found with smothering injuries and some victims were dumped in a river or lake after death. Hemorrhagic shock and brain injury were also found to have occurred in a few cases.

**3.6. Position of the ligature marks**

Of the 141 hanging cases, 99 were forward hanging, 29 cases were lateral hanging and 2 were backward hanging cases, while 11 cases had no detailed description. One-hundred-and-twelve cases included a detailed description of the position of the ligature marks, including 87 (61.70%) cases above the thyroid cartilage, 20 (14.18%) as high as the thyroid cartilage, and 5 (3.55%) below the thyroid cartilage. Of the 178 strangulation cases, 105 included a detailed description of the position of the marks, including 40 cases where the marks were above the thyroid cartilage, 44 where the marks were as high as the thyroid cartilage, and 21 where the marks were below the thyroid cartilage (Table 2).

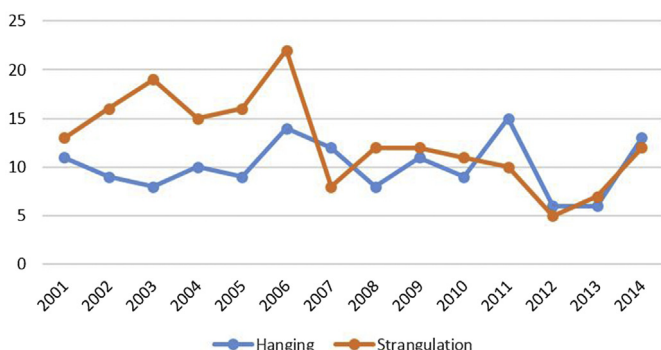


Fig. 1. Year distribution of the 319 cases.

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