

**PAPER****ANTHROPOLOGY**

Debra A. Komar,<sup>1</sup> Ph.D. and Sarah Lathrop,<sup>2</sup> D.V.M., Ph.D.

## Patterns of Trauma in Conflict Victims from Timor Leste

**ABSTRACT:** Understanding population-level trauma patterns has implications for the recognition of war crimes and crimes against humanity. Trauma data were abstracted from autopsy and anthropology reports for 105 victims from the 1999 conflict in Timor Leste. A significant number of individuals displayed no evidence of injury. No trauma was found in 25% of the sample, while a further 5% had only minor, nonlethal wounds. Where trauma was evident, sharp force injuries were most common (35%), followed by gunshot (20%) and blunt force (13.33%). Timorese frequencies of trauma differ significantly from percentages found in prior reports of mass killings from Cambodia, Bosnia, Croatia, and Afghanistan but closely resemble reported trauma patterns in Rwanda. Decomposition and percentage of body recovered were shown to have a significant impact on the presence/absence of trauma. Complete, fleshed remains were 10.4 times more likely than skeletal remains to have evidence of major or lethal trauma.

**KEYWORDS:** forensic science, forensic anthropology, blunt force trauma, sharp force trauma, gunshot wounds, international human rights

Prior researchers have argued that population-level studies of trauma and mortality should be considered evidence of conflicts ranging from genocide to civilian mass shootings (1–3). Numerous variables must be taken into consideration when interpreting trauma patterns within a population, including demographics, the number of wounds per victim, anatomic location of lesions, trajectory, and weapon type (3), as well as patterning of injuries and the level of healing observed. One of the most significant variables to consider is the ratio of those wounded to those killed (2,3). Coupland and Meddings argue that a wounded-to-killed ratio that falls below 1.0 “should lower the threshold of suspicion and provide evidence of war crimes” (2, p. 409). Calculating such statistics, however, can prove difficult in case of conflict outside the international laws of war, where the number of survivors is either unknown or likely to be zero (2,4). Although mortality figures may not be calculated in such cases, analysis of trauma patterns at the population level provides an independent avenue of investigation, allows comparison with prior conflicts, and generates vital information not captured by the traditional forensic examination at the level of the individual.

To demonstrate the value of population-level trauma analysis, this report examines autopsy and anthropology reports of victims of crimes against humanity from Timor Leste, a tiny island nation 400 miles northwest of Australia.

### Historical Context

On August 30, 1999, after 24 years of Indonesian rule, the people of Timor Leste (commonly known as East Timor) voted overwhelmingly to become an independent nation. Beginning

<sup>1</sup>School of Natural Science and Psychology, Liverpool John Moores University, Liverpool L3 3AF, UK.

<sup>2</sup>Office of the Medical Investigator, MSC11 6030, University of New Mexico, Albuquerque, NM 87131-0001.

Received 19 July 2010; and in revised form 23 Nov. 2010; accepted 3 Dec. 2010.

September 1, 1999, a massive campaign of organized violence spread through the country, perpetrated by Timorese militias equipped and financed by Indonesian armed forces (5). The campaign included the following: widespread rape, torture, destruction of property, and an estimated 1000–2000 murders (5,6). The United Nations Security Council authorized a multinational force to restore peace, as well as a large-scale humanitarian operation. On August 30, 2001, Timor Leste held its first free elections and on May 20, 2002, became the world’s newest democracy (6).

In June 2000, the United Nations Transitional Administration in East Timor (UNTAET) created the Special Panels for Serious Crimes within the Dili District Court and the Serious Crimes Unit within the Office of the Prosecutor General of East Timor. The Special Panels have jurisdiction over crimes committed between January 1 and October 25, 1999 (5). The current United Nations Integrated Mission in Timor Leste (UNMIT) includes a Serious Crimes Investigative Team (SCIT), complete with Forensic Science and Investigative departments tasked with documenting crimes associated with Timor Leste’s 1999 bid for independence. The SCIT is authorized by and reports to the Timorese Office of the Prosecutor General. The senior author (DK) served as the UNMIT SCIT Forensic Anthropologist in 2009.

### Materials and Methods

Data were abstracted from autopsy and anthropology reports generated by the United Nations Serious Crimes Forensic Unit, including anthropology reports written by the senior author (DK). Variables recorded included the following: the sex and estimated skeletal age of the victim; the degree of trauma; trauma type (blunt force [BFT], sharp force [SFT], gunshot wound [GSW], strangulation); decompositional stage; and percentage of body recovered. Degree of trauma was recorded as absent, minor, or major following Komar et al. (7), in which Class IV trauma (nonlethal) was categorized as minor and Classes I, II, and III (lethal or lethal

potential) were categorized as major. Decompositional stages fresh/bloated; active/advanced decomposition; and skeletal represent collapsed categories described previously (8,9). Categories for percentage of body recovered (following [10]) were as follows: complete (>75% of the skeletal elements recovered), partial (<75% elements recovered), and skull only using the weighting of elements outlined in Grisbaum and Ubelaker (11). Although radiographic examination of remains was possible in certain circumstances through a local hospital, the standard autopsy protocol did not include radiographic examination.

All data were entered into a Microsoft Excel spreadsheet and analyzed using SAS version 9.2 (SAS Institute Inc., Cary, NC). Categorical variables were compared using either chi-square tests or Fisher exact tests, depending on sample size. *p*-Values of 0.05 or less were considered statistically significant.

## Results

The total sample size was 105. Demographic statistics are outlined in Table 1. Men were overrepresented within the sample at 92.38%. Descriptive statistics relating to trauma are reported in Table 2. A summary of findings relating to decomposition and the percentage of body recovered is provided in Table 3.

Tests of statistical significance comparing the variable of trauma type (major/minor/absent) against the percentage of body recovered (complete/partial/skull only) produced a *p*-value of 0.14. Comparisons of trauma type against stage of decomposition (fresh/fleshed or decomposed/skeletal) resulted in *p* = 0.43.

Further analyses were conducted using collapsed categories for each variable where combining categories were biologically plausible. Comparing cases with no or little evidence of trauma to those with evidence of major trauma by percentage of body recovered (partial remains or skull only vs. complete remains) resulted in an odds ratio of 2.34 (*p* = 0.079 and a 95% confidence interval [CI] of 0.82–6.87). Comparing numbers of skeletal remains to those that were fresh or partially decomposed by the presence or absence of major trauma resulted in an odds ratio of 2.65, which also approached statistical significance (*p* = 0.067, 95% CI = 0.83–8.99).

A further test of the significance of the percentage of body recovered, and decompositional stage was conducted. Complete sets of remains were examined in isolation and compared against the collapsed categories for decompositional stage and trauma type. Complete remains in a fresh or partially fleshed state were 10.4 times more likely to have evidence of major trauma than skeletal remains (*p* = 0.03, 95% CI = 0.97–260.7).

TABLE 1—Demographic statistics (*n* = 105).

	Frequency	Percentage
Sex		
Male	97	92.38
Female	3	2.86
Undetermined	5	4.76
Age cohorts (years)		
<18	8 (7 M, 1 U)*	7.62
19–29	31 (30 M, 1 F)	29.52
30–39	11 (11 M)	10.48
40–49	12 (12 M)	11.43
50+	3 (3 M)	2.86
Adult†	40 (34 M, 2 F, 4 U)	38.10

\*Breakdown by sex; M, male; F, female; U, undetermined.

†Denotes a separate category of individuals whose age category was defined as adult at autopsy.

TABLE 2—Breakdown of trauma, by the presence/absence and type (*n* = 105).

	Frequency	Percentage
Trauma		
Absent	26	24.76
Minor (nonlethal)	5	4.76
Major	74	70.48
Trauma type		
None	26	24.76
Blunt force (BFT)	14	13.33
Gunshot wound (GSW)	21	20.00
Sharp force (SFT)	35	33.33
BFT and SFT	5	4.76
BFT and strangulation	1	0.95
GSW and SFT	2	1.90
SFT and strangulation	1	0.95

TABLE 3—Breakdown of decomposition stages and percentage of body recovered (*n* = 105).

	Frequency	Percentage
Decomposition stage		
Fresh	3	2.86
Advanced decomposition	27	25.71
Skeletal	75	71.43
Percentage of body recovered		
Complete	37	35.24
Partial	63	60.00
Skull only	5	4.76
Percentage of body recovered by decomposition stage		
Complete/fresh	3	2.86
Complete/advanced decomposition	18	17.14
Complete/skeletal	16	15.24
Partial/advanced decomposition	9	8.57
Partial/skeletal	54	51.43
Skull only/skeletal	5	4.76

## Discussion

The overrepresentation of men in crimes against humanity has been noted and discussed previously (12). The circumstances surrounding the death of victims in Timor Leste were not included in the autopsy or anthropology reports. Accordingly, it is not possible to surmise whether female victims in Timor Leste were expressly targeted or represent collateral casualties.

A number of factors confound investigators' attempts to assess trauma and determine the cause and manner of death. Decomposition and soft tissue decay alter or destroy the evidence of injury. A prior study of GSWs to the chest found that in 14% of cases, the bullet did not strike any bone or create any osteological defect (13). The percentage of remains recovered also negatively skews investigative efforts. One prior study found that in cases where <50% of the body is covered, cause and manner determination rates dropped to 41% (10). The findings here suggest that studies or reports that identify the presence or absence of lethal trauma only without controlling for the variables of decompositional stage or percentage of body recovered may be misrepresenting or misinterpreting the true level of violent acts perpetrated against the victims.

Although the United Nations' investigation of the Timorese conflict, including recovery and autopsy of victims, began in 2000, the process continued for more than 10 years. The delay in recovery, combined with the local practice of collecting scattered skeletal surface remains and reburial, resulted in both advanced

stages of decomposition and incomplete remains. The results of this study suggest that these factors alone may explain the high incidence of victims with no evidence of lethal traumatic injury.

Analysis by trauma type also proved informative and allows for comparisons against prior conflicts. The frequency of GSWs reported here (21.9%) is lower than percentages reported previously for Bosnia and Herzegovina (38.9%) (1), Croatia (79.8–85.3%) (14), Cambodia (29%) (15), and Afghanistan (46%) (16). The availability of weapons, as well as the rates of other trauma types (such as BFT), likely contributes to this variation. GSWs were higher than in a prior report from Rwanda, in which only one GSW was evident in 493 victims (0.2%) (17).

The incidence of BFT (13.3%) and SFT trauma (40%) in the current study also differs from the previous reports of victims of crimes against humanity. A prior study on cranial trauma in Cambodia (18) found that 12% of skulls showed BFT trauma, while only 2.4% of the skulls had evidence of SFT trauma. Slaus et al. (14) found BFT injuries in only 2.9% of victims recovered from wells and 1.1% of those found in nonwell environments in Croatia. The findings of this study most closely resemble trauma patterns detailed in a prior report from Rwanda, in which 36% of recovered individuals died from sharp/BFT injuries from machetes or similar sharp instruments (17). Such similarities indicate concordance in the perpetrators' reliance on readily available weaponry, such as farm implements and other improvised sharp tools, and the absence of firearms among the general population. This pattern strongly suggests that the perpetrators were drawn from the local citizenry, rather than representing an adequately equipped military force.

## Conclusion

Analysis of trauma patterns at the population level provides a valuable source of evidence and a means of understanding and interpreting large-scale violence in extra-legal conflicts. Examinations of victim demographics reveal the specific attributes of those targeted and may offer clues as to why they were selected (12). Review of trauma types (BFT, SFT, and GSW) support witness and survivor statements regarding the weaponry utilized by the perpetrators and the nature of the perpetrators themselves (i.e., civilian vs. military). Studies of interpersonal violence that focus only on the presence or absence of major (lethal) trauma must take into account the variables of the stage of decomposition of the remains and the percentage of the body recovered to properly interpret results and accurately identify the percentage of victims who died of violent acts.

Analysis of trauma at the population level also allows for comparisons among conflicts occurring in different geographic or temporal frameworks. Such comparisons may be able to identify hallmarks or signatures of differing forms of interpersonal conflict (e.g., genocide, conventional warfare, or crimes against humanity). Further research is warranted to address this potentially significant form of evidence.

## Acknowledgments

The authors are grateful to Josee D'Aoust of the Serious Crimes Investigation Unit of the United Nations Integrated

Mission in Timor Leste for her assistance in obtaining permission to publish this paper and to the Office of the Prosecutor General of Timor Leste for approving the publication of this information.

## References

- Baraybar JP, Gasior M. Forensic anthropology and the most probable cause of death in cases of violations against international humanitarian law: an example for Bosnia and Herzegovina. *J Forensic Sci* 2006;51:103–8.
- Coupland RM, Meddings DR. Mortality associated with use of weapons in armed conflicts, wartime atrocities and civilian mass shootings: literature review. *Br Med J* 1999;319:407–10.
- Warren MW. Interpreting gunshot wounds in the Balkans: evidence for genocide. In: Brickley MB, Ferlini R, editors. *Forensic anthropology: case studies from Europe*. Springfield, IL: Charles C Thomas, 2007; 151–64.
- Raszeja S, Chroscielowski E. Medicolegal reconstruction of the Katyn forest massacre. *Forensic Sci Int* 1994;68:1–6.
- Cohen D. Indifference and accountability: the United Nations and the politics of international justice in East Timor. Honolulu, HI: East-West Center Special Reports #9, 2006.
- Official Web Gateway to the Government of Timor-Leste—History. [Electronic document] <http://gov.east-timor.org/AboutTimorleste/history.htm> (accessed November 25, 2009).
- Komar D, Lathrop S, Potter W. Proposed classes of morphological autopsy findings for decomposed and skeletal remains. *Am J Forensic Med Pathol* 2008;29:290–4.
- Komar D, Buikstra J. *Forensic anthropology: contemporary theory and practice*. New York, NY: Oxford University Press, 2008.
- Anderson GS, Van Laerhoven SL. Initial studies on insect succession on carrion in southwestern British Columbia. *J Forensic Sci* 1996;41:617–25.
- Komar D, Potter W. Percentage of body recovered and its effect on identification rates and cause and manner of death determination. *J Forensic Sci* 2007;52:528–31.
- Grisbaum GA, Ubelaker DH. An analysis of forensic anthropology cases submitted to the Smithsonian Institution by the Federal Bureau of Investigation from 1962 to 1994. *Smithsonian Contributions to Anthropology* No. 45. Washington DC: Smithsonian Institution Press, 2001.
- Komar D. Variables influencing victim selection in genocide. *J Forensic Sci* 2008;53:172–7.
- Langley NR. An anthropological analysis of gunshot wounds to the chest. *J Forensic Sci* 2007;52:532–7.
- Slaus M, Strinovic D, Pecina-Slaus N, Brkic H, Balicevic D, Petroveckic V, et al. Identification and analysis of human remains recovered from wells from the 1991 war in Croatia. *Forensic Sci Int* 2007;171:37–43.
- Meddings DR, O'Connor SM. Circumstances around weapon injury in Cambodia after departure of a peacekeeping force: prospective cohort study. *BMJ* 1999;319:412–5.
- Michael M, Meddings DR, Ramez S, Gutierrez-Fisac JL. Incidence of weapon injuries not related to interfacional combat in Afghanistan in 1996: prospective cohort study. *BMJ* 1999;319:415–8.
- International Criminal Tribunal for Rwanda indictment. Prosecutor v. Clement Kayishema and Obed Ruzindana, ICTR-95-1-T, Judgment, May 21, 1999, para. 326, [www.ictor.org/ENGLISH/cases/KayRuz/judgment/5.html](http://www.ictor.org/ENGLISH/cases/KayRuz/judgment/5.html) (accessed July 7, 2010).
- Ta'ala SC, Berg GE, Haden K. Blunt force cranial trauma in the Cambodian killing fields. *J Forensic Sci* 2006;51:996–1001.

Additional information—reprints not available from author:

Sarah Lathrop, D.V.M., Ph.D.  
Office of the Medical Investigator  
MSC11 6030  
University of New Mexico  
Albuquerque, NM 87131-0001  
E-mail: SLathrop@salud.unm.edu