Original Article

Clinical and Pathological Discrepancies and Cardiovascular Findings in 409 Consecutive Autopsies

Aline Fusco Fares, Jorge Fares, Gislaine Fusco Fares, José Antônio Cordeiro, Marcelo Arruda Nakazone, Patrícia Maluf Cury

Hospital de Base da Faculdade de Medicina de São José do Rio Preto, São José do Rio Preto, SP, Brazil

Abstract

Background: Discrepancies between clinical and autopsy diagnoses persists worldwide.

Objective: We evaluated autopsies in a university hospital in order to assess the accuracy of clinical cardiovascular diagnosis compared to postmortem findings.

Methods: Four hundred nine consecutive autopsies between 2003 and 2006 were analyzed in a tertiary-care hospital in São José do Rio Preto, SP, Brazil. The comparison of clinic-pathological cardiovascular findings was performed using Goldman's discrepancies classification.

Results: Autopsy rate at the hospital was 8%. Cardiovascular causes of death represented 42.8% (175 out of 409 patients) of autopsy diagnoses. In 98 (56%) patients, there were major discrepancies (class I and II), representing a large proportion of misdiagnoses for mesenteric infarction (84.6%), acute myocardial infarction (64.7%), aorta dissection (64.2%), and pulmonary embolism (62.5%). Highest concordance rates were observed in congestive heart failure (59%) and acute ischemic stroke (58.8%). Age, sex, length of stay and the last admission unit at the hospital were not associated with Goldman criteria.

Conclusions: Clinic-autopsy discrepancies concerning cardiovascular death remain high in Brazil, despite technological resources available. Moreover, our findings reinforce the importance of postmortem examination in contributing to medical care improvement. (Arq Bras Cardiol 2011;97(6):449-453)

Keywords: Cardiovascular diseases, autopsy, diagnostic, clinical diagnosis, dause of death.

Introduction

The importance of autopsies is a common theme of discussions both in Brazil and around the world as it elucidates causes of death and has wide ranging social value. On the other hand, it is a practice that is gradually being considered unnecessary, reflecting the decline of autopsy rates. In Australia, for example, rates have dropped from 21% at the start of the 1990s to around 12% in 2003[1] and in the United States of America, in 2002, the proportion of autopsies were lower than 5%[2]. Nowadays, the advances in medical technologies, as well as economic and legal reasons are cited as justifications for this decline[3]. However, autopsy is still one of the most reliable methods to validate clinical diagnoses[4].

Considering necropsy as the gold standard for diagnostic confirmation, several studies show that the discrepancies between clinical and autopsy diagnoses persisted in spite of progress in medical skills and technology[5,6]. In 1983, these discrepancies were classified by Goldman et al[7] considering their importance for clinical practice, suggesting that attention be given to therapeutically significant errors whose correction could contribute to medical care improvement[8]. In a general hospital, the study of clinic-autopsy discrepancies is important as an internal check on the quality of care, in order to identify selected disease groups, patients, or medical units with a higher risk for discrepancies[9].

Diagnoses of cardiovascular diseases were the most frequently missed diagnoses in the patients that died in a general hospital experience. Discrepancies between clinical and pathology diagnoses may occur due to the high frequency of the disease, diagnostic difficulties, or even because of the sudden nature of some diseases (myocardial infarction, aorta dissection, pulmonary embolism, stroke), which do not allow adequate time for clinical investigations[10].

A few studies have evaluated the comparison of clinical and autopsy cardiovascular diagnoses in a general hospital with a large outpatient clinic and emergency department specializing in cardiology as well as an active department of pathology. Therefore, we have retrospectively analyzed consecutive autopsies over a 4-year period in a tertiary-care hospital from Brazil in order to assess the accuracy of clinical

cardiovascular diagnosis as compared to postmortem findings using Goldman's discrepancies classification.

Methods

A retrospective cross-sectional study was performed comparing the diagnoses listed on clinical and autopsy reports of 409 consecutive patients who were admitted between January 2003 and December 2006 and who died at the Hospital de Base, São José do Rio Preto Medical School, SP, Brazil. This is an Institution with 718-bed public general tertiary-care hospital that also provides primary and secondary care, and includes a large outpatient and an emergency department. In this analysis, 175 patients died due to cardiovascular diseases. The causes of this group were studied and clinical and pathological diagnoses were compared. The Research Ethics Board approved the study.

Autopsies were performed by six pathologists, after medical request and family consent following ethical and legal requirements, within 24 hours of death, including macroscopic examination and microscopic investigation of the internal organs. The brain, heart, lungs, kidneys, liver, and spleen were examined in all cases. Causes of death were classified according to the 10th edition of the International of Diseases.

An intern, a senior pathologist, and two general clinicians, have analyzed the medical records and the autopsy reports of non-consecutive, randomly chosen patients. Pre and post-mortem diagnoses were classified into distinct classes according to the level of agreement, adapted from the Goldman et al[7] criteria (Class I: missed major diagnosis with potential adverse impact on survival and that would have changed management; Class II: missed major diagnosis with no potential impact on survival and that would have not changed therapy; Class III: missed minor diagnosis related to terminal disease but not related to the cause of death; Class IV: missed minor diagnosis with epidemiological or genetic importance; Class V: absolute agreement; and Class VI: uncertain autopsy diagnosis). For the purpose of analysis, classes I and II were grouped as disagreement, and classes III, IV, and V were labeled as concordance.

From each patient, data were identified by age, gender, and length of hospitalization, admission unit, medical history, medical evolution, clinical diagnoses, and macroscopic and microscopic findings of the autopsy. To obtain the clinical diagnoses, we analyzed all patient files. Incomplete medical records, individuals whose length of hospitalization was smaller than one hour and those aged below fifteen were excluded from the analysis.

The comparison of proportions between groups was performed using the χ^2 test. We also compared the most frequent cause of confusion between clinical and autopsy diagnoses. An alpha error of 5% was considered acceptable giving a level of significance for p values < 0.05.

Results

Out of 119,091 hospital admissions between 2003 and 2006, deaths occurred in 8,127 (6.82%) cases and autopsies were performed in 650 (8%) of these. Cardiovascular causes of death represented 42.8% (175 out of 409 patients) of autopsy diagnoses. Out of the 175 patients analyzed in our series, 110 (62.9%) were males. Patients' ages ranged from 24 to 91 years, their median ages were 59 years old. Age and sex had no association with Goldman criteria (p = 0.81).

Forty-six (26.3%) patients died within 24 hours of admission. Lengths of stay exceeding 24 hours was not associated with Goldman criteria major discrepancies (p=0.93). In terms of the hospital unit in which the patients died, 91 (52%) patients were admitted to the emergency room at the time of death, 35 (20%) were admitted to the wards, 32 (18.3%) of them to the intensive care unit, and 17 (9.7%) patients were admitted to the surgery department.

In our series, acute myocardial infarction and congestive heart failure represented 38.9% and 22.3% of the cardiovascular diagnoses, respectively. Pulmonary embolism and aorta dissection were evidenced in only 13.7% and 8% of the individuals, respectively. Moreover, acute ischemic stroke and mesenteric infarction were observed in 9.7% and 7.4% of them, respectively.

In 2004 and 2006, there was a higher frequency (49%) of concordance clinic-pathological diagnoses. By contrast, in 2003 and 2005, only 40.3% of cases had concordant diagnoses (p = 0.004). Considering 2003 to 2006, in 98 (56%) patients there were major discrepancies (class I and II), representing a large proportion of misdiagnoses. The three most frequent diagnoses that were clinically confused with acute myocardial infarction were referred by pneumonia in 11 (25%) patients, pulmonary embolism in 5 (11.4%) and ulcer in 5 (11.4%) cases of disagreement. The last admission unit at the hospital did not influence the probability of misdiagnosis (p = 0.21). The highest concordance rates were observed in congestive heart failure (59%) and acute ischemic stroke (58.8%, Table 1).

Discussion

This study shows that the overall rate of postmortem examination is low and falling[9,11,12]. Cardiovascular diseases were found to be the main cause of death (42.8%) of autopsy diagnoses, confirming the impact of cardiovascular findings described by other authors[6,10,13]. The 8% autopsy rate in our series is similar to hospital autopsy rates in the United States (12%) and some studies in United Kingdom (11 to 24%)[14]. This fact have been interpreted to be a consequence of many factors, including the intense technological development observed in medical areas in recent years allowing the clinical diagnoses during life, the increasing reluctance of many clinicians to ask for permission to undertake a postmortem examination, the cost of an autopsy, and the possibility that the autopsy will reveal medical errors which could originate lawsuits[8].

Our main finding was that major diagnostic errors (classes I and II) occur in 56% of our population, extrapolating the limit error rate (49.8%) evidenced in data from 53 distinct autopsy series over a 40-year period

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published by Shojania et al[15] in a systematic review. This fact may be justified because our autopsies are performed only in atypical cases of diagnostic uncertainty in a referral center[16], confirming that even with modern diagnostic techniques, discrepancies between clinical diagnoses and post-mortem findings continue to occur[12], and vary over time[15]. This illustrates the ongoing importance of autopsy as an instrument of feedback on the clinical diagnostic and therapeutic process in general medicine, providing a lower bound for the major error rate[15,17]. However, it remains unclear whether clinically missed diagnoses represent errors per se, rather than acceptable limits of ante mortem diagnosis in the face of atypical clinical presentations[15].

Acute myocardial infarction, responsible for 38.9% of all cardiovascular-related deaths, was the most common cause of death in our study. There was agreement between the clinical and pathological diagnoses in 33.8% of these cases. Respiratory diseases, in particular pneumonia, were the main causes of death diagnosed in discordant acute myocardial infarction cases, probably due to the similarities in both the clinical symptoms of patients and occasionally radiological signs between the two diseases[6,18]. Most of these patients were hospitalized because of pulmonary infections and evolved with an acute aggravation of the symptoms which was attributed to the pulmonary infection and not acute coronary syndrome.

Considering the cardiovascular findings analyzed in our study, the more commonly missed clinical diagnoses were mesenteric infarction (84.6%), acute myocardial infarction (64.7%), aorta dissection (64.3%), and pulmonary embolism (62.5%). The high range of classes I and II to diagnostic errors found in ischemic intestinal disease may be due to a low index for suspicion and because this disease has relatively few symptoms (diarrhoea and moderate leucocytosis) and may be easily missed or mistaken for other entity[17]. Despite the improved diagnostic options, Perkins et al[12], showed that acute myocardial infarction remains a frequent major missed diagnosis. Considering our analysis, it is very possible

that a patient who was clinically classified as having died of other cause was found on autopsy to have died of an acute myocardial infarction or aorta dissection. Moreover, several studies found that pulmonary embolism has been the most common misdiagnosed condition[6,9,17]. Its clinical picture may be mild and almost asymptomatic and not easily recognized, making the diagnosis more difficult[13]. The lower incidence of error rates for congestive heart failure and acute ischemic stroke suggests that their clinical signs are often interpreted as representing of these conditions, thereby reducing the discrepancy rates.

It might be expected that the longer a patient stays at the hospital, the more likely the clinical and autopsy diagnoses would be to agree. However, this fact was not observed in our series, corroborating previous investigations in wide hospitals[6,9,13]. We not observed a significant correlation between the last admission unit and the level of agreement, in contrast to Gibson et al[18] that found the lowest frequent of concordant diagnoses in the emergency room (33.6%) and the highest (68.4%) in the intensive care unit. The elevated discrepancy rates with advancing patient age evidenced by this author[18] was not observed in our results and in analysis described previously[3,12]. In cases with a poor prognosis, which are more common in elderly, it is possible that the physician and the patient's relatives decide not to proceed with clinical investigations, which can contribute to a greater chance of misdiagnosis in the older population[9]. Like this one, a large number of previous studies found no correlation between diagnosis and sex[6,7,13].

There are several limitations to our study. It is a small and a retrospective study with a low autopsy rate, and judgments were made about classification of the diagnostic accuracy in each patient, it is difficult to determine how representative the extent of these findings at post-mortem examination are of the overall general population. Given that a post-mortem examination is more usually requested when diagnostic uncertainty exists, it may be more likely to identify unexpected findings, leading to a falsely high

Table 1 - **Distribution of the classes of diagnostic comparison according Goldman criteria relative to cardiovascular findings**

Cardiovascular finding	Classes of diagnostic comparison						Total	Concordance (%)
	I	II	III	IV	V	VI		
Acute ischemic stroke	6	-	1	2	7	1	17	58.8
Acute myocardial infarction	41	3	7	3	13	1	68	33.8
Aorta dissection	9	-	-	2	3	-	14	35.7
Congestive heart failure	11	2	2	5	16	3	39	59.0
Mesenteric infarction	10	1	1	-	1	-	13	15.4
Pulmonary embolism	15	-	2	2	4	1	24	33.3
Total (%)	92 (52.6)	6 (3.4)	13 (7.5)	14 (8.0)	44 (25.1)	6 (3.4)	175 (100)	40.6

Class I - missed major diagnosis with potential adverse impact on survival and that would have changed management; Class II - missed major diagnosis with no potential impact on survival and that would have not changed therapy; Class III - missed minor diagnosis related to terminal disease but not related to the cause of death; Class IV - missed minor diagnosis with epidemiological or genetic importance; Class V - absolute agreement; and Class VI - uncertain autopsy diagnosis. Notice that the highest concordance rates are observed to congestive heart failure (59%) and acute ischemic stroke (58.8%).

incidence of missed diagnoses. Finally, the diagnostic work-up of each individual was not critically reviewed, and it is possible that variability in investigation influenced the incidence of error rates.

Conclusion

We conclude that the rates of disagreement between clinicians and pathologists' diagnoses concerning the cause of cardiovascular death are still high, despite available technological resources. Moreover, our findings reinforce the importance of the post-mortem examination in providing data for the evaluation of the quality of care, teaching and research, detecting unexpected diagnoses in general medicine. Most importantly, further studies conducted in centers with high autopsy rates would permit

development of strategies for using autopsy findings to improve subsequent clinical performance.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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