



MINIMALLY INVASIVE AUTOPSIES AS A DIAGNOSTIC TOOL FOR PATHOLOGY – A LITERATURE REVIEW



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Marcelo Rocha Campos¹ and Juliana Salomão Daud Melo²

ABSTRACT

This is a literature review study that seeks to highlight the importance of minimally invasive autopsies (AMIs) as a tool in the process of diagnosing cause of death, justifying its relevance through the analysis of the main techniques, benefits and challenges. Thus, the objective was to highlight its applicability and final results found. Methodologically, an exploratory and comparative literature review was carried out, focusing on the qualitative analysis of the literature. As a result, it was found that the reviewed studies emphasize the importance of minimally invasive autopsies as an effective tool to understand the causes of death in different contexts, especially during the COVID-19 pandemic and other cases of natural deaths. It was also concluded that minimally invasive autopsies emerge as a viable and efficient option in relation to conventional autopsies, with the potential to revolutionize the practice of surgical pathology.

Keywords: Minimally Invasive Autopsies. Post-Mortem Diagnosis. Medical Imaging Technologies. General Pathology.

¹ Resident Physician in Pathology
Federal University of Uberlândia
Orcid: <https://orcid.org/0009-0008-7089-2549>

² Specialist in Pathology
Federal University of Uberlândia
Orcid: <https://orcid.org/0000-0002-5778-6169>



INTRODUCTION

Minimally invasive autopsies (AMIs) represent an innovative approach in the field of pathology, promoting post-mortem diagnoses with less interference in the physical integrity of the body. Unlike traditional autopsies, which involve complete dissection, AMIs use advanced techniques, such as imaging tests and guided biopsies, to investigate causes of death. This methodology has emerged as a relevant alternative in the face of cultural, religious, and emotional barriers that often limit the performance of conventional autopsies, especially in certain geographic and population contexts.

The overall objective is to conduct a literature review on the use of minimally invasive autopsies, highlighting their main histological findings, their applicability, benefits, and limitations. Regarding the specific objectives, it was estimated: to identify the main techniques used in AMIs, to ascertain the results obtained with these techniques in comparison to traditional autopsies and to evaluate the impact of AMIs in ethical, cultural and economic terms.

Thus, the following question-problem guides this research: "What does the specialized literature report about minimally invasive autopsies?"

METHODOLOGY

The present study used a methodological approach based on an exploratory and comparative literature review, focusing on qualitative literature analysis. To this end, the research focused on identifying, gathering and reviewing scientific publications related to the theme, seeking to elucidate the contributions, limitations and gaps that exist on the applicability of minimally invasive autopsies.

The data sources were obtained from the Virtual Health Library (VHL), using the keywords "minimally", "invasive" and "autopsy". The LILACS and MEDLINE databases were prioritized, restricting them to articles published in Portuguese and English and excluding texts in Spanish. The exclusion criteria involved: repeated articles, studies whose theme did not directly address AMIs, especially those that did not mention the term in the title, studies related to animal autopsies, closed or incomplete publications, and works by the same author with similar findings.

After the filtering process, a total of 14 articles were reached, which constituted the corpus of analysis. The selection included works published in the last 5 years, with an emphasis on dates after 2019, ensuring the contemporaneity of the data and aligning with recent technological advances in the field of AMIs.

Finally, this literature review sought to integrate the results obtained in a systematic and critical manner, with the purpose of contributing to the expansion of knowledge about minimally invasive autopsies, considering their advances, challenges, and perspectives.

RESULTS

The findings of this research show that the use of minimally invasive autopsies comes as a promising diagnostic tool in various scenarios, especially during the COVID-19 pandemic. Thus, the studies, their objectives, and their results and/or histological findings were compiled in Table 1.

Table 1: Synthesis of studies with histological findings

| Study | Objective of the study | Results/Findings |
|------------------------------------|--|--|
| Farias <i>et al.</i> [1] | Report a case of human rabies in a patient from the rural area of Ceará in 2023 who was bitten by a marmoset. The patient was coinfecting with COVID and died. | Histological findings in the central nervous system: signs of gliosis and positive staining for rabies antibodies in immunofluorescence. |
| Almeida <i>et al.</i> [2], | Establish an AMI protocol in cases of arboviruses in Ceará | Consolidation of an AMI protocol with evaluation of eight key organs: brain, right lung, left lung, liver, spleen, right kidney, left kidney, heart. |
| Savoia <i>et al.</i> [3] | Establish a correlation between postmortem CT scans and pulmonary histological findings in COVID deaths | There is a correlation between the severity of computed tomography findings and histological findings, without a specific correspondence of lesions. |
| Koenigkam-Santos <i>et al.</i> [4] | Evaluation of CT scans of 46 patients with mild, moderate, and severe viral pneumonia related to pulmonary histological findings | Radiological phenotyping of viral pneumonia was identified, with a prevalence of fibroproliferative alterations and organizing pneumonia, potentially indicative of post-infection interstitial fibrosis. |
| Melo <i>et al.</i> [5] | Case report of the use of AMI in a 10-year-old patient who died of severe dengue during the COVID-19 epidemic. | Histological findings: Liver with necrosis of mediozonal hepatocytes and rare acidophilic bodies; Lungs: enlargement of the alveolar septa by inflammatory cells (viral interstitial pneumonitis), edema, and foci of intraalveolar hemorrhage; Kidneys: acute tubular necrosis. |
| Geber Júnior <i>et al.</i> [6] | Case report of death from visceral leishmaniasis with co-infection with bacterial pneumonia and COVID19 in the metropolitan area of São Paulo. | Histological findings: bone marrow aspirate showing amastigote forms in the cytoplasm of macrophages and lungs with foci of suppurative pneumonia and bacillus colonies within alveoli. |
| Santana <i>et al.</i> [7] | To establish a relationship between conventional autopsies and AMI's in 14 deaths from severe SARS-CoV-2 in Mexico and to describe the histological findings of AMI's. | Most prevalent histological findings: Lung with early diffuse alveolar damage; Kidneys with acute tubular injury, interstitial nephritis and glomerulitis; liver with neutrophilic inflammation and hepatic necrosis. |

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| Martin <i>et al.</i> [8] | To investigate brain changes in cases of COVID19 by magnetic resonance imaging and 7 tesla computed tomography and histological analysis by AMI | CNS histological findings: reactive gliosis, congestion, eosinophilic degeneration of the cortical neuron, and axonal rupture in all cases. |
| Hurtado <i>et al.</i> [9] | To describe the pulmonary findings observed in MIA in cases of deaths from SARS-CoV-2 virus. | Histological findings: The lung is the main organ affected by SARS-CoV-2, and diffuse alveolar damage is observed in the exudative and mixed phases in the reported cases. |
| Theodoro Filho <i>et al.</i> [10] | Investigation of cardiopulmonary changes in cases of COVID-19 deaths using expanded MIA techniques with thoracotomy less than 5 cm. | Results: Expanded MIA allows the evaluation of large vessels, thromboembolic phenomena, and acute myocardial infarction. |
| Silva <i>et al.</i> [11] | Evaluation of post-mortem computed tomography radiological findings performed together with MIA in five cases of deaths by COVID19 in São Paulo between 2020 and 2021. | In the five cases analyzed, postmortem CT recorded disease progression, however, hypostases impair the analysis of the posterior lung region, and permanent expiration may impair some findings. |
| Duarte-Neto <i>et al.</i> [12] | Description of autopsy findings with a minimally invasive method in five pediatric COVID19 cases. | Autopsy findings varied among patients and included mild to severe COVID-19 pneumonia, pulmonary microthrombosis, cerebral edema with reactive gliosis, myocarditis, intestinal inflammation, and hemophagocytosis. |
| Caballero <i>et al.</i> [13] | A population-based study in Buenos Aires from 2018 to 2020 that combines histological analysis by AMI and verbal autopsies to determine the epidemiological profile of deaths in children under 5 years of age. | Pulmonary infections were the most common causes of death, with acute bronchillitis and bacterial pneumonia |
| Melo <i>et al.</i> [14] | This descriptive study discusses the use of AMI's during the covid-19 pandemic and its possibilities, especially in developing countries. | Describes the application and efficacy of AMI as an alternative to conventional autopsy |

Taken together, these studies highlight the progressive importance of minimally invasive autopsies as an effective tool for understanding causes of death in different contexts, including the COVID-19 pandemic.

DISCUSSION

This research reinforces that minimally invasive autopsies represent an important evolution in the field of pathology, offering a promising alternative to conventional autopsies in which the complete opening of the body is performed. AMIs can be indicated in contexts of infectious diseases with a high risk of contagion or situations in which the family does not authorize the opening of the body and thus include the possibility of accurate and detailed



diagnosis without the need for incision, providing benefits for both professionals and families.

CONCLUSION

Although AMIs have shown efficacy comparable to traditional autopsies in a variety of clinical settings, especially with the use of advanced imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI), there are limitations, especially with regard to the evaluation of blood vessels and hollow viscera, as well as the unrepresentative analysis of an organ. Thus, minimally invasive autopsies are not a substitute for conventional autopsies and their use should be considered in specific situations only.



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