

# Acceptance of Forensic Imaging in Israel

Sigal Tal MD<sup>1,3\*</sup>, Nadav Berkovitz MD<sup>1,3\*</sup>, Paul Gottlieb MD<sup>1,3</sup> and Konstantin Zaitsev MD<sup>2</sup>

<sup>1</sup>Department of Radiology, Assaf Harofeh Medical Center, Zerifin, Israel

<sup>2</sup>National Center of Forensic Medicine, Tel Aviv, Israel

<sup>3</sup>Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

**ABSTRACT:** **Background:** Forensic imaging was officially introduced in Israel in 2011. Religious and cultural opposition to autopsies prevails in most of the population of Israel.

**Objectives:** To examine the extent to which forensic imaging has been accepted as an adjuvant or partial replacement of forensic autopsy, particularly among those opposed to forensic autopsy.

**Methods:** The study was conducted in the pediatric population. Data were collected from the National Center of Forensic Medicine and Assaf Harofeh Medical Center during the 18 month period following the introduction of forensic imaging (group A). The data were compared to those of the previous 18 months (group B). The examined parameters were cases submitted, examined, autopsied or imaged depending on family consent.

**Results:** Consent to autopsy was similar in both groups (A = 56% vs. B = 54%). In group A, consent for imaging was 24% of all cases, and of those imaged 77% underwent autopsy. Of those examined externally only, 16% consented to imaging. For 7% of the total cases in group A, estimation of cause of death was based on virtopsy alone.

**Conclusions:** In a country with a high level of religious and cultural opposition to autopsy, it is a challenge to add forensic imaging to the pediatric forensic investigation. Those consenting to forensic imaging are more likely to be those consenting to autopsy. Consent for forensic imaging only was given in 7% of cases. Greater efforts should be invested to educate and inform the public regarding the benefits of virtual autopsy and the importance of data acquired from forensic images.

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**KEY WORDS:** postmortem, virtopsy, autopsy, forensic imaging, National Institute of Forensic Medicine

Autopsy remains the most reliable method to validate postmortem clinical diagnoses [1]. Clinical autopsies are performed to investigate the cause of death and the extent of natural disease for purposes of understanding the cause of death. In the case of criminal investigations, autopsy can shed light on the cause of injuries, and correlate the cause of death with eyewitness accounts. Nevertheless, autopsy rates

have declined in recent years due to its high cost, the fear of legal ramifications, and improvement in diagnoses based on medical technology. In fact, Goldman et al. [1] showed that the rate of discovering major unexpected findings through autopsy has remained stationary at 10%. However, one of the pivotal reasons for the decline in autopsy is the family's refusal to authorize it for religious and cultural reasons. In medico-legal cases, a postmortem examination is often ordered by a legal authority and permission from family members is not necessarily requested. Depending on local law, the expressed opposition from next-of-kin is often listened to and dealt with on a case-by-case basis. A number of cases have been reported in which autopsy was objected to on religious grounds, which obstructed the investigation [2,3]. Such challenges to the autopsy procedure result in a conflict between individual rights and the limitation of these rights under the rule of law. This conflict of interest is particularly striking in Israel.

Israel is a small country and all autopsies for the entire country are performed at the National Institute of Forensic Medicine. About 2500 investigations of sudden and unexpected deaths take place each year at the Institute. Autopsies can only be performed in cases of family consent, or by court order [4]. In Israel, autopsy is a contentious subject. Jewish tradition recognizes life after death and considers the body sacred. Strict religious interpretation thus precludes the violation of the body in any way after death. In Judaism, autopsies have kindled controversies related to religious issues surrounding desecration of the human body, delayed burial, organ harvesting, and burial of a corpse with organs removed [5]. This has led to a situation where bodies destined for autopsy were stolen from examination tables; such events have been dramatized in the press [6].

However, when an autopsy can save other lives, the commandment of *pikuah nefesh* (saving others' lives) supersedes other prohibitions. Thus, in cases where autopsy could identify a hereditary disease, religious authorities allow autopsy. When permitted, autopsies are expected to be restricted to designated body parts, and conducted promptly to enable rapid burial. When an autopsy is required for legal reasons, it may be difficult to secure permission from family members.

In Islam, the issues are similar and reflect concerns for a prompt burial, avoiding 'harm' to the body, and prohibitions on removing body parts. As in Judaism, considerations of

\*The first two authors contributed equally to this study

the benefits of autopsy can overrule prohibitions if autopsy can lead to advances in science and important medical diagnoses, or enhance education. There is a general consensus that autopsy of an unidentified person involved in a serious accident is warranted and does not violate Islamic law. When legal authorities request an autopsy, Moslems are expected to comply but can request that the procedure be performed as quickly as possible.

However, as a result of recent developments in the field of virtual autopsy (“virtopsy”) some of these prohibitions can now be overcome. Developed by Thali and co-workers [7], virtopsy is based on the implementation of radiological imaging. The specifics of virtopsy techniques were described in detail in a recent review [8] which discusses the use of multi-detector computed tomography (MDCT) or postmortem magnetic resonance imaging (PMMRI). The main technical issues involved in correct image acquisition are the postmortem interval (PMI) and corpse temperature (in particular for MRI). CT is considered superior to autopsy in evaluation of trauma, particularly for delivering good osseous imaging by displaying fractures without disturbing the normal anatomy in body areas that are not typically examined in autopsy such as the face or areas that are difficult to examine (posterior ribs) [9], and in the detection of hematomas. MRI is considered better for imaging the brain and the spine and plays an important role in investigations of children and in cases of suspected hanging.

The motivation to introduce forensic imaging in Israel has come mostly from religious Jewish groups. The Ultra-Orthodox community in Israel has actively opposed the forensic procedure, sometimes violently. When opposition is presented through the legal system, the courts demand an alternative if autopsy is to be avoided. The increase in publications regarding the advantages of virtopsy has at least partially convinced both the Ultra-Orthodox communities and the Forensic Institute to consider virtopsy a possible solution to the problem. After overcoming the many bureaucratic obstacles and the issue of funding (private donations), a pilot program was initiated.

Given the advantages of virtopsy over autopsy with regard to respecting religious prohibitions, it seemed reasonable to expect that family members will be more inclined to accept virtopsy. The present study examined the extent to which forensic imaging has been accepted as an adjuvant and partial replacement. For this purpose we compared permissions to conduct autopsies during two time periods: before the introduction of forensic imaging in Israel in 2011 and during the 18 months after its introduction. We hypothesized that since forensic imaging does not conflict with religious or cultural mores, the percentage of authorizations for virtopsy would be much higher than the percentage of permissions for autopsy for similar cases in the period preceding its introduction.

To better gauge the response to virtopsy, we focused on a forensic pediatric postmortem population. In the United

States, the American Committee on Child Abuse and Neglect recommended that autopsy be required for all deaths of children under the age of 6, including children with chronic diseases [10]. Forensic pediatric autopsy in Israel requires a high level of suspicion in order to obtain a court order. Forensic investigation beyond surface external examination requires the permission of parents or guardians. If the surface examination does not show any signs of trauma, court orders for further examination (autopsy or imaging) are rare. For this population the type of examination would be affected more by the guardian’s attitude to examination than legal considerations. Therefore, this population in particular can shed light on the rate of acceptance of forensic imaging.

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## MATERIALS AND METHODS

The sample comprised 227 cases referred to the National Institute of Forensic Medicine in Israel that were under the age of 18 at the time of death between January 2010 and January 2013. Forensic imaging was introduced in Israel in mid-2011. Institutional Review Board approval was granted for this study.

The cases were divided into two groups according to date of death: group A included 125 cases presenting in the 18 months after July 2011, i.e., after the introduction of forensic imaging; group B comprised 102 cases presenting in the 18 months before and up to July 2011, prior to the introduction of forensic imaging.

In addition to the presence or absence of forensic imaging, for each case the nature of the existing forensic examination was noted as: a) external examination only, and b) autopsy. Autopsy was performed in 68 of the 125 cases in group A (54%) and 57 of the 102 cases in group B (56%). It should be noted that the study population included only cases of forensic interest. Non-forensic fetal death was not included.

## DATA SOURCE AND COLLECTION

All autopsies were performed at the National Institute of Forensic Medicine in Israel. All data were taken directly from the official reports signed by a senior forensic pathologist. Forensic imaging was conducted in the radiology department of Assaf Harofeh Medical Center, Israel.

## STATISTICAL ANALYSIS

To test for differences between time periods and between sub-groups, chi-square and Fisher exact tests were used. The data were analyzed using SAS<sup>®</sup> version 9.1 (SAS Institute, Cary, NC, USA).

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## RESULTS

There was no significant difference between the percentage of cases autopsied in group A (after the introduction of forensic

imaging) and group B (before the introduction of forensic imaging); chi-square = 0.05,  $P = 0.82$ .

In group A, 30 cases underwent both autopsy and forensic imaging (24% of total cases, 44% of autopsy cases) while 9 cases underwent forensic imaging only (7% of total cases, 16% of refused autopsy cases). This difference was significant (chi-square = 11.60,  $P = 0.0007$ ). Conversely, 77% of imaged cases were also autopsied. Thus, statistically, the permission to image was given by those who permitted autopsy. Imaging alone (from the population opposed to autopsy) was allowed in only 7% of the cases.

When breaking down group A into three 6-month periods and comparing them, no statistically significant difference was found in the percentage of authorizations to image in general or specifically for those refusing autopsy (chi-square tests,  $P > 0.05$ ) [Tables 1 and 2].

## DISCUSSION

State-of-the-art postmortem investigation combines forensic autopsy and forensic imaging [8]. Although forensic imaging is not viewed as violating cultural or religious beliefs that preclude autopsy, the findings here show that there was still considerable opposition to imaging. Thus, even in the population that accepted autopsy and can be considered the most open to intervention, less than half (44%) also opted for forensic imaging. Statistically, the population agreeing

to autopsy was the major source of the population agreeing to imaging. However, this figure did not change over the 18 months of the study, despite efforts to explain the advantages of imaging. For the population with the most to gain from imaging – those who refused autopsy – the permission to image was given in 7% of the total number of cases (16% of the subgroup refusing autopsy). These findings suggest that several key issues need to be addressed to increase the acceptance of forensic imaging.

There is lack of familiarity with the possibilities offered by forensic imaging in Israel, including the medical community. In an environment of suspicion towards the Institute of Forensic Medicine, a conservative attitude prevails. Furthermore, in the brief interval following the death of a family member when authorities are likely to request forensic imaging and/or autopsy, the initial conservative reaction will prevent the performance of any procedure.

Another concern that can account for opposition to imaging has to do with fears among family members that once the corpse is taken to the hospital for imaging, dissection or organ removal might occur, which would be concealed from family members. Since actual cases such as these have come to light in the popular news media [11-13], such fears cannot be dismissed lightly.

In addition, there are few authority figures outside of the Forensic Institute who are aware of the advantages of forensic imaging and support its use. This is particularly true for religious and cultural leaders. In times of grief the authority figures in general do not have the information required to encourage vortopsy. Since forensic imaging does not contravene the central religious tenets of the major religions in Israel, the barrier is more one of ignorance. Thus, educating and involving religious and cultural figures in forensic imaging should be a priority.

Another possible barrier is the lack of legal status of vortopsy. Since the procedure has yet to be codified, lawyers on both sides are unlikely to recommend the procedure. Making forensic imaging a *legally* necessary part of the accepted autopsy procedure or a legal partial replacement would make it appear routine.

Another significant issue that needs to be overcome is logistical availability. Jews, Moslems and Druze all require prompt burial. The delays involved in arranging forensic imaging have been reported in some published articles to be close to a week [14], whereas religious observance requires burial within a much shorter time span, usually the same day. Forensic CT or MRI should be available throughout the day to enable examination before prompt burial.

This study has several limitations that deserve mention. Firstly, the sample was restricted to individuals under the age of 18. While the reasoning was to limit the number of autopsies required by court order, this study is restricted to a subsection of the population. Secondly, the study did not have access to personal data of the family of the deceased. Therefore, we were

**Table 1.** Permission to conduct postmortem investigations before and after the introduction of forensic imaging in Israel in 2011

	External examination	Autopsy	Imaging	Both autopsy and imaging
Group A: after introduction of forensic imaging	57 (46%)	68 (54%)	9 (7%)	30 (24%)
Group B: before the introduction of forensic imaging	45 (44%)	57 (56%)	N/A	N/A

**Table 2.** Changes in attitudes over time: comparison of permissions in the first, second and third 6 month period after the introduction of forensic imaging

	External examination	Autopsy	Imaging	Both autopsy and imaging
Group A: first 6 months after introduction of forensic imaging	15 (39%)	23 (61%)	2 (5%)	8 (21%)
Group A: second 6 months after introduction of forensic imaging	30 (63%)	18 (38%)	6 (13%)	14 (47%)
Group A: third 6 months after introduction of forensic imaging	12 (31%)	27 (69%)	1 (3%)	8 (21%)

unable to break down the attitudes per specific religious and cultural identification.

### CONCLUSIONS

Greater efforts should be made to educate and inform the public about the benefits of virtual autopsy and the importance of data acquired from forensic imaging. Religious and cultural leaders should also be encouraged to take a stand. Trust in forensic institutes is a key factor that will impact the wider acceptance of forensic imaging.

Forensic imaging has yet to acquire a legal status in Israel and its findings cannot yet be presented in court as a substitute (or in conjunction) with autopsy reports. Thus, there is a need to encourage documentation of more cases that can lead to future legislation, which would pave the way for greater public acceptance of this methodology.

### Correspondence

**Dr. N. Berkovitz**

Dept. of Radiology, Assaf Harofeh Medical Center, Zerifin 70300, Israel

**Fax:** (972-8) 954-2113

**email:** nadavber@gmail.com

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