

Incidental Findings of Pathological Lesions of Adrenal Gland from Routine Autopsy of Medicolegal Cases

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ABSTRACT

Introduction: Asymptomatic adrenal pathology may be overlooked in routine autopsy examination unless the clinico-pathological correlation is urgently needed (pathological autopsy). This research has further included the possible role of adrenal in a death due to apparently unknown etiology. Study aimed to find out the occurrence of various pathological lesions of adrenal, to classify the pathological lesions into benign and malignant and to find out the gross and histopathological change of adrenal in stressful condition (like accident, hanging, burn etc).

Material and methods: Observational, descriptive, cross sectional study was done in the department of Pathology, R. G. Kar Medical College and Hospital, Kolkata and the department of Forensic Medicine and Toxicology, R.G. Kar Medical College and Hospital, Kolkata and time frame of 12 month (1st April 2013 to 31st March 2014). Sample size was 106. Inclusion Criteria were cases of all accidental death and cases of all death due to unknown cause.

Result: We found cases of adrenal cortical nodule, lymphocyte infiltrate, cortical adenoma and myelolipoma respectively 22.64%, 16.03%, 3.77%, 1.88% and 0.94%.

Conclusion: This study emphasizes the importance of forensic autopsies for epidemiological and clinical analysis. Adrenal cortical lymphocytic infiltrate may be associated with autoimmune adrenalitis. Cortical adenoma, nodule may be associated with essential hypertension in old age.

Keyword: Incidental, Adrenal Gland, Autopsy

INTRODUCTION

Autopsies are important in clinical medicine as they can identify medical error and assist continuous improvement. Clinical or Pathological autopsies are performed to diagnose a particular disease or for research purposes. They aim to determine, clarify, or confirm medical diagnoses that remained unknown or unclear prior to the patient's death.

A discrepancy rate as high as 40%^{2,1} approximately exists between the ante-mortem and the post-mortem diagnosis. Diseases of the adrenal gland are responsible for great deal of mortality and morbidity. A large number of people are affected every year by adrenal disease. Early diagnosis of some adrenal disease allows the clinicians to treat the patient at an early stage and help to reduce sufferings of the patient. But each and every pathological lesion does not necessarily manifest overt clinical features and the patients with minor pathological lesions do not seek medical advice. Some of this pathological lesion can be identified only incidentally at autopsy.

A few studies have been done in India and abroad in the field

of adrenal autopsy and

hardly any recent work can be found out through thorough search. In this era of dwindling pathological autopsy, the medico-legal autopsy will be a supplement to record the occurrence of adrenal disease in the study population. It is well known that the formulation of health care planning is very much dependent on incidence, prevalence, frequency and distribution of a particular disease. But data of those parameters regarding adrenal diseases in Indian subcontinent are not adequate.

MATERIAL AND METHODS

Current observational, descriptive, cross sectional study was conducted in Department of Pathology, R. G. Kar Medical College and Hospital, Kolkata (a tertiary care hospital in eastern India, Department of Forensic Medicine and Toxicology, R.G. Kar Medical College and Hospital, Kolkata and the police morgue attached to R. G. Kar Medical College and Hospital, Kolkata, India. It was done for 12 month (1st April 2013 to 31st March 2014) on sample 106.

Study Population

Bodies of persons, autopsies of whom were performed at Police Morgue attached to R. G. Kar Medical College and Hospital during the study period.

Sample Design

Cases: Death cases on whom autopsy was held at Police Morgue attached to R. G. Kar Medical College and Hospital during the study period.

Inclusion Criteria

1. Cases of all accidental death.
2. Cases of all death due to unknown cause.

Exclusion Criteria

1. Cases of all death due to diagnosed adrenal pathology.
2. Cases from mutilated bodies.

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- 3. Cases which could not be taken for medicolegal reasons.
- 4. Decomposed dead body.

Method of Data Collection

- Observation.
- Record from post-mortem report.

Type of Sampling

Cases were selected by random sampling method, taking all cadavers meeting the inclusion and exclusion criteria on the particular days in which autopsies were conducted.

Study Tools

- a) Predesigned proforma (Case record form).
- b) Consent form.
- c) Previous medical records (if available)
- d) Standard autopsy instrument set.
- e) Usual pathological instruments---scalpel, scalpel blades, forceps, knives, glass vials for collection of specimens, 10% formol - saline, various grades of alcohol, xylene, paraffin, incubator. Leuckhart’s L blocks, microtome, various stains, slides, cover slip etc.
- f) Binocular Lawrence and Mayo Microscope.

Study Technique

After approval from institutional ethical committee and informed written consent from the relatives of the deceased, the study was initiated. The medico-legal autopsies performed at the Police Morgue attached to R.G.KAR Medical College and Hospital was attended; detailed history was obtained from the investigating officer and/or relatives of the deceased. All the important findings were noted down in the predesigned case record form and later included in the master chart. Total bilateral adrenalectomy was done.

At the time of autopsy the specimens of adrenal were examined thoroughly to find out any pathological lesion grossly. The gross description like, size, weight, surface, dimension, cut surface etc. were noted. Photographs of the specimens were taken. After gross examination sections from the apparently abnormal site were taken. These sections were prepared for microscopic examination through multi-step process. The slides thus prepared were examined to detect the pathological lesions. After examination the results were analyzed accordingly.

Examination of Adrenal

The adrenals were examined meticulously to find out any

gross abnormalities and the findings were noted in the case record forms. On the day of removal of organ; weight and measurement were noted, the adrenals were cut, and carefully opened. Photographs of the specimen were taken. The specimen was then placed in 10% buffered formalin saline for fixation. After overnight fixation the specimen were examined and following parameters were noted.

Procedure

- 1 Weight and measurement of the specimen were taken.
- 2 The specimen was oriented and parallel sections at 5 mm intervals in the transverse plane were cut either in the fresh or after formalin fixation.

Description of Procedure

- 1 Type of specimen was total adrenalectomy from both sides.
- 2 Weight, shape, color, and consistency of specimen were noted.
- 3 Appearance of cut surface was noted; whether smooth or nodular? If nodular: number, size, and appearance of nodule (cystic? Calcified? Hemorrhagic? Necrotic?); encapsulated or invasive? Were noted.

Sections For Histology

- 1. For non - neoplastic gland, some random sections from both side of adrenal glands were taken.
- 2. For a solitary encapsulated nodule, entire circumference was taken. Most of sections include the tumor capsule and adjacent adrenal tissue.

STATISTICAL ANALYSIS

All data were collected, compiled and subjected to suitable statistical analysis (Independent sample test). Statistical analysis was done using “SPSS version 20 software”. If the null-hypothesis is rejected (P<0.05), then the conclusion is that there is a statistically significant difference between at least two of the subgroups.

RESULT

In this present study out of 106 cases, we found 38.7% of cases with histopathological change and 61.3% of normal cases. In 65 normal cases the mean age was 31.92 ± 11.730 and in 41 cases with histopathological change the mean age was 57.32 ± 15.842. The mean between normal and with change cases show statistically significant difference (Table – 1).

Cases	Number	Percentage	Mean	SD	Std Error of mean	T	df	P
Normal	65	61.3%	31.92	11.730	1.455	-9.459	104	<0.001
With change	41	38.7%	57.32	15.842	2.474			

Table-1: Average age of study subject normal and with change and Independent sample test.

Histopathological change	Number of case	Percentage of case (%)	Mean age	Standard Deviation of age
Adrenal cortical nodule	24	22.64	61.87	14.69
Lymphocyte infiltration	17	16.03	61.35	17.25
Adrenal haemorrhage	4	3.77	36.25	6.29
Adreno cortical adenoma	2	1.88	70	2.82
Myelolipoma	1	0.94	62	-

Table-2: Distribution of cases according to spectrum of histopathological change and mean age of presentation.

Age	Number of patient	Number of patient having nodule	(%)	Total number of nodule	Number of Nodule Per case
0 – 10	1	0	0	0	0
11 - 20	11	0	0	0	0
21 - 30	20	0	0	0	0
31 - 40	24	2	8.33	2	1
41 - 50	19	4	21.05	4	1
51 - 60	16	8	50	16	2
>60	15	10	66.66	32	3.2

Table-3: Distribution of adrenocortical nodule according to age of presentation and number.

Age	Number of cases in study	Number of cases showing lymphocyte infiltration	Percentage (%)
0 – 10	1	0	0
11 – 20	11	0	0
21 – 30	20	0	0
31 – 40	24	2	8.33
41 – 50	19	3	15.78
51 – 60	16	3	18.75
60 – 70	6	3	50
>70	9	6	66.67

Table-4: Distribution of cases of adrenal cortical lymphocyte infiltration according to age.

Here we found 24(22.64%) cases of adrenal cortical nodule, 17(16.03%) cases of lymphocyte infiltration, 4(3.77%) cases of haemorrhage, 2(1.88%) cases of cortical adenoma and one(0.94%) cases myelolipoma (Table-2)

In the present study, incidentally detected adrenal mass found in 2.8% of cases (Total number of cases-106 and incidentally detected adrenal mass-3), comprising of two adrenal cortical adenoma and one myelolipoma, in the age group of above 60 yrs. Out of three cases two was male and one female. So sex distribution was 2:1.

This study shows that prevalence of adrenal cortical nodule is 22.64%. Prevalence increases with increase of age(61.87±14.69). So this is an ageing process and number of nodule increase with ageing. In most of the cases multiple nodules were found and at the same time they were mostly bilateral. (Table-3)

The present study shows percent of cases of adrenal lymphocyte infiltrate increases with increase of age. It is also an ageing process. Most of the cases were present above 70yr. (Table-4)

Adrenal haemorrhage has been found in 5.88% of road traffic accident and 6.97% of total blunt trauma abdomen cases (Road traffic accident+Train traffic accident+other blunt injuries). Among the burn cases, 7.14% shows adrenal haemorrhage. (Table-5)

It has been found that the prevalence of adrenal cortical adenoma is 1.88% with an average diameter of 4.1 cm (one was 4 cm and another one was 4.2 cm) and shows equal sex distribution. Both the tumor was unilateral.

In this study we found only one case of myelolipoma which was unilateral tumor in the age group of above 60 yrs. According to our study the frequency of myelolipoma was

History	Number of cases in study	Number of cases showing adrenal haemorrhage	Percentage (%)
Road traffic accident	17	1	5.88
Train traffic accident	19	2	10.52
Other blunt injury	7	0	0
Burn	14	1	7.14

Table-5: Distribution of patient of adrenal haemorrhage according to history.

0.943%. The maximum diameter of adrenal myelolipoma was 4cm and the weight was 74gm. Sex distribution could not be obtained due to single case.

DISCUSSION

In present study 106 medico legal autopsy cases were included to know the various adrenal lesions in asymptomatic cases. The study was done in R.G. Kar Medical College and Hospital, Police Morgue from April 2013 to March 2014. The data were recorded; results were inferred, analyzed and further compared with available studies and literature regarding the same.

Incidentally detected adrenal mass:

In the present study of 106 cases, incidentally detected adrenal mass was found in 2.8% of cases in the age group of above 60yrs.

Brazon L et al³, Kloos RT⁴ et al, Rineheart et al.⁵, Russi et al⁶, Commons and Callaway⁷, Schroede⁸, Devenyi⁹, Kokko et al.¹⁰, Hedeland et al.¹¹, Yamada and Fukunaga¹², Granger and Genes¹³, Russell et al.¹⁴, Abecassis et al.¹⁵, Meagher et al.¹⁶, Reinhard et al.¹⁷ in their study found that prevalence of incidentally detected adrenal mass was 2.3%, 6.9%, 3%, 1.45%, 2.88%, 1.38%, 3.55%, 1.05%, 8.70%, 5.40%, 2.52%, 1.97%, 1.90%, 5.00%, 5.00% and mostly found in older age group.

Our study correlates with the study of Brazon L et al³, Rineheart et al⁵, Commons and Callaway⁷, Granger and Genes¹³.

Adrenal cortical nodule

In this present study we found 22.64% cases of adrenal cortical nodule. In the age group of 0-10 yrs, 11-20 yrs and 21-30 yrs there was no case of adrenal cortical nodule but in the age group of 31-40yrs, 2(8.33%) out of 24 cases; 41-50 yrs, 4(21.05%) out of 19 cases; 51-60 yrs, 8(50%) out

of 16 cases and above 60yrs, 10(66.66%) out of 15 cases had shown adrenal cortical nodule. Number of cases increase with increase of age. So this is an ageing process. In this study, average number of nodule per case in the age group of 31-40 yrs, 41-50yrs, 51-60 yrs and above 60 yrs was respectively 1, 1, 2 and 3.2. So, number of nodules increase with increase in age. Regarding laterality, most of the cases (62.5%) were bilateral.

This study resembled the studies of DeLellis RA, Mangray S¹⁸, Rosai J¹⁹ and Neville AM²⁰. DeLellis RA, Mangray S¹⁸ concluded the incidence of cortical nodule in autopsy studies was 25% and it was multicentric, bilateral and according to Rosai J¹⁹ cortical nodules were usually multiple. Neville AM²⁰ concluded it as part of ageing process.

Adrenal cortical lymphocyte infiltration

According to Lloyd RV, Douglas BR, Young WF²¹ focal aggregates of lymphocytes are an incidental finding in the adrenal cortices of normal adults and increase in frequency with the age of the patient. Hayashi Y et al²² studied 110 of 174 autopsy cases with age greater than 60 years (63.2%) were shown to have mononuclear cell infiltration of varying degree within the adrenal cortex, whereas such a lesion was observed in lesser incidence (7.4%) in the 54 younger, control subjects aged less than 49 years. In addition, severely infiltrating lesions in the adrenal cortex were found frequently in the elderly greater than 70 years.

It has been found from the present study in the age group of (0-30) yrs shows no cases of lymphocyte infiltration. In the age group of (31-40)yrs, (41-50)yrs, (51-60)yrs and >60yrs show 2(8.33%), 3(15.78%), 3(18.75%) and 9(60%) cases of lymphocyte infiltration respectively. So it is an ageing process. We found 9 cases of lymphocyte infiltration of above 60 yrs, of which 3(50%) cases were between 61-70 yrs and 6(66.67%) cases were above 70 yrs.

So this study correlates with the study of Lloyd RV, Douglas BR, Young WF²¹ and Hayashi Y et al²².

Adrenal haemorrhage (AH)

John M et al²³ studied 269 deaths were caused by blunt force (RTA and other), with 21 (7.8%) patients experiencing AH. Death caused by only RTA shows 7.1% of cases of AH. According to Izquierdo RS, Brufau BP, Cafaia RO²⁴ the potential causes of unilateral haemorrhage is trauma, tumor and spontaneous, and bilateral haemorrhage is stress, haemorrhagic diathesis, coagulopathy and spontaneous. Cheng WT et al²⁵ were studied 82 cases of adrenal haemorrhage. They found that adrenal hemorrhage occurred mostly in cases of sudden death, infection, trauma and asphyxia. AH is more common in male.

Our study resembled the study of John M et al²³. In our study 5.88% of RTA shows adrenal haemorrhage, 10.52% of TTA shows adrenal haemorrhage. In blunt trauma injury 6.97% cases shows adrenal haemorrhage. Other than RTA, 26 cases had blunt trauma injury of which 7.69% had adrenal haemorrhage.

Out of 14 cases of burn in our study 7.14% shows adrenal haemorrhage and it was bilateral haemorrhage.

Kallinen O, Koljonen V²⁶ was reviewed all adult (age >18 years) burn patients. They identified four patients, creating a prevalence of 5.6%.

Adrenal cortical adenoma

In this present study we got only two cases of adrenocortical adenoma and both were above 60 yrs of age with a prevalence of 1.88%. Both tumor show equal sex distribution and both was unilateral.

Our study correlates with the study of Kloss et al²⁷ and Devenyi I²⁸. Kloss et al²⁷ found wide variation in prevalence of adrenal adenomas i.e 1-32% in autopsy series. Incidentally detected adrenal adenomas occur with equal frequency in males and females, and common with increasing age.

Devenyi I²⁸ in his study of 5,120 consecutive necropsies cases adrenocortical adenomas were noted in 185 cases. 82% of the adenomas belonged to cases in the age range 51-80 years. The frequency of adenoma seems to be influenced mostly by age.

Moraitis A, Hammer GD et al²⁹ conclude that true incidence of adrenal adenoma unknown because many are not functional, estimates include 8.7% in autopsy series.

Young WF Jr and Gross MD et al^{30, 31} had examined the frequency of incidental adrenal adenoma in numerous autopsy studies. In a report on 25 studies, the overall frequency of adrenal adenomas in 87,065 autopsies was 6%. In the present study the size of one adrenocortical adenoma was 4 cm and another was 4.2 cm. So the average diameter of adrenocortical adenoma was 4.1 cm. According to Schteingart DE³² et al adenomas are characteristically small, rarely exceeding 5 cm in greatest diameter.

Myelolipoma

In this present study we got only one case of myelolipoma out of 106 cases (0.943%). The age of the patient was above 60 yrs and it was unilateral. The maximum diameter of adrenal myelolipoma was 4cm and the weight of adrenal gland was 74gm.

According to McDonnell WV³³ and Olsson CA et al³⁴ the reported prevalence of myelolipoma at autopsy, ranges from 0.03% to 0.2%. Study done by Sanders R et al³⁵ and Po-Chun Lin, Fei-Shin Yang³⁶ the prevalence of myelolipoma in autopsy series was respectively 0.08% to 0.2% and 0.08% - 0.4%.

Lam KY and Lo CY³⁷ in their study detected eight cases of myelolipoma during necropsy, giving a postmortem prevalence of 0.06%. Mean age was 62 years (range, 41-81) at the time of necropsy. The mean diameter of the adrenal myelolipomas was 4.3 cm (range, 0.3-14.5) and the mean weight of the adrenal gland was 141 g (range, 4-1018).

Our study shows slightly higher frequency of myelolipoma than the study of McDonnell WV³³, Olsson CA et al³⁴, Lam KY and Lo CY³⁵ probably due to our small study population and short duration of study.

CONCLUSION

Very few studies have been undertaken on adrenal gland itself. Our present study can illuminate and provide

necessary feedback to the clinician in charge of patient care with increase accuracy and effectiveness.

We have some peculiar observations. Adrenal cortex of many aged patients with lymphocyte infiltration may represent a preclinical manifestation of organ specific autoimmune adrenalitis. This data may give insight into further search of pathogenesis of autoimmune Addison's disease. Finding of adrenal cortical adenoma and cortical nodule are best regarded as part of the aging process and may have association with essential hypertension in older age group.

The data from the present work suggests that the adrenal glands are being injured when there is significant blunt abdominal trauma. It may be time to relook into the role of hypothalamic-pituitary-adrenal axis in cases of severe blunt trauma. These patients may benefit from exogenous steroid administration. However more study need to be undertaken before the final acceptance of the protocol.

We were severely constrained by limitation of sample size, duration of study and financial backup. Therefore, we need to study larger sample size to achieve more realistic incidence of asymptomatic adrenal lesions more in general population.

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