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J.N.A Clegg-Lamptey, MBChB, FRCS, FWACS, FGCS, Lecturer, Department of Surgery, H. Armah, MBChB, Resident, Department of Pathology, S.B. Naaeder, MBChB, FRCS, FWACS, MD, FGCS, Professor and N.A. Adu-Aryee, MBChB, FWACS, FGCS, Lecturer, Department of Surgery, University of Ghana Medical School, P.O. Box 4236, Accra, Ghana

Request for reprints to: Mr. J.N.A. Clegg-Lamptey, Department of Surgery, University of Ghana Medical School, P.O. Box 4236, Accra, Ghana

POSITION AND SUSCEPTIBILITY TO INFLAMMATION OF VERMIFORM APPENDIX IN ACCRA, GHANA

J.N.A CLEGG-LAMPTEY, H. ARMAH, S.B. NAAEDER and N.A. ADU-ARYEE

ABSTRACT

Objectives: **To determine the normal (non-inflamed) position of the vermiform appendix in Ghana and carry out a pilot study to test the hypothesis "The retrocaecal appendix is less prone to inflammation".**

Design: **Retrospective autopsy study.**

Setting: **The pathology department and the department of surgery theatres of the Korle Bu Teaching hospital in Accra, Ghana**

Subjects: **Consecutive autopsies and inflamed appendices at appendicectomy. Deaths occurring from untreated appendicitis were excluded from the autopsy study. Conversely non-inflamed appendices and appendices from interval appendicectomy were excluded from the appendicitis study.**

Results: **There were 1358 autopsies and 323 inflamed appendices. In the autopsy study the retrocaecal position was the most common (914 [67.3%]). Other positions were pelvic (294 [21 .6%]), preileal (66 [4.9%]), postileal (51 [3.8%]) and paracaecal (33 [2.4%]). These positions were similar in males and females. The positions of 323 inflamed appendices were: retrocaecal (183 [56.7%]), pelvic (66 [20.4%]), preileal (20 [6.2%]), postileal (15 [4.6%]) and paracaecal (39 [12.1%]). Comparing the non-retrocaecal to the retrocaecal position by chi square, the non-retrocaecal position was more prone to inflammation ($p<0.001$).**

Conclusion: **The position of the normal appendix in Ghana differs from Western literature. The retrocaecal position appears less prone to inflammation in Ghanaians.**

INTRODUCTION

Appendicitis accounts for about 30% of all general surgical emergency operations in the Korle Bu Teaching Hospital in Accra, Ghana (1,2). Though initially rare in the early 1940s the incidence of appendicitis increased by 1970 to become a common surgical emergency in Accra (3). The incidence has since become stable and is currently 3.18/10 000 of the population (2).

Appendicitis is the great mimicker and may mimic any acute abdominal condition as well as some non-abdominal conditions. One of the reasons for this is the variability in its position. Although some studies have shown that its position does not alter the clinical presentation of appendicitis (4,5), some specific symptoms and signs have been attributed to specific positions. Thus flexion of the hip (psoas sign) sometimes occurs in retrocaecal appendicitis and diarrhoea, irritation of the urinary

bladder and the obturator sign sometimes occur in pelvic appendicitis (6). The appendix is said to occupy the retrocaecal position in 74% and the pelvic position in 21% of people (1,7). The other positions are preileal, postileal, subcaecal and paracaecal. The factors that determine the position of the appendix are not known. Although the position of the inflamed appendix in Ghanaians has been reported before (2,8,9), the position of the normal appendix in Ghana has not been studied.

The position of the inflamed appendix does not indicate its normal position. Apart from the true retrocaecal appendix, the organ probably floats in a broad arc about its base and is only fixed by inflammation to a particular place (10). The position recorded at operation does not therefore represent the position of the normal appendix. Secondly, different anatomical positions may affect . its susceptibility to acute inflammation (11). Thus the retrocaecal position, with its base pointing downwards, is less likely to be obstructed from intraluminal faecoliths and therefore less prone to become inflamed. It has been postulated that the retrocaecal appendix is less prone to inflammation (11).

This study sought to determine the position of the normal appendix in Ghana. We also carried out a limited study to test the hypothesis that "The retrocaecal appendix may be less prone to inflammation" by determining the position of inflamed appendices removed at operation during the same period.

MATERIALS AND METHODS

The position of the normal appendix was recorded during autopsies performed at the Korle Bu Teaching Hospital mortuary from July 2001 to June 2004. One of the authors recorded the positions of the normal appendix in all post-mortem examinations performed under the following: retrocaecal, pelvic, paracaecal, preileal and postileal. The subcaecal position was included in the paracaecal group. The age and sex were also recorded. Deaths occurring from untreated appendicitis were excluded since the appendix was inflamed at the time of death.

The positions of the inflamed appendix in consecutive patients with appendicitis presenting to a surgical unit of the Korle Bu Teaching hospital were also recorded during the same period. Non-inflamed appendices were excluded from the study. Appendices from interval appendicectomy were similarly excluded. The five positions identified were retrocaecal, pelvic, preileal, postileal and paracaecal. The age and sex of these patients were also recorded.

The data were recorded and analysed using Microsoft Excel. The positions of normal and inflamed appendices were compared using chi square (Epi Info 2000).

RESULTS

Post-mortem findings: There were 1358 post-mortem examinations performed, 759 males and 599 females. The most common position was the retrocaecal position, in 914 cases (67.3%). The next was the pelvic position, in 294 cases (21.6%). Other positions were less common: preileal 66 (4.9%), postileal 51 (3.8%) and paracaecal 33 (2.4%)(Table 1) .

As shown in Table 2, the positions were similar in both sexes. Thus the retrocaecal appendix in males compared to females was 66.4% and 68.4% respectively. Similarly the pelvic position was found in 22.4% and 20.7% in males and females respectively.

Table 1

Position of the normal appendix at post-mortem

Position	No.	(%)
Retrocaecal	914	67.3
Pelvic	294	21.6
Preileal	66	4.9
Postileal	51	3.8
Paracaecal	33	2.4
Total	1358	100

Table 2

Position of normal appendix by sex distribution (Percentages in parenthesis)

Sex	Retrocaecal	Pelvic	Preileal	Postileal	Paracaecal	Total
Male	504 (66.4)	170 (22.4)	41 (5.4)	29 (3.8)	15 (2.0)	759
Female	410 (68.4)	124 (20.7)	25 (4.2)	22 (3.7)	18 (3.0)	599
Total	914	294	66	51	33	1358

Table 3

The position of the inflamed appendix

Position	No.	(%)
Retrocaecal	183	56.7
Pelvic	66	20.4
Preileal	20	6.2
Postileal	15	4.6
Paracaecal	39	12.1
Total	323	100

Table 4

Position of inflamed appendix by sex distribution (Percentages in parenthesis)

Sex	Retrocaecal	Pelvic	Preileal	Postileal	Paracaecal	Total
Male	125 (57.1)	46 (21.0)	12 (5.5)	10 (4.6)	26 (11.9)	219
Female	58 (55.8)	20 (19.2)	8 (7.7)	5 (4.8)	13 (12.5)	104
Total	183	66	20	15	39	323

Position of inflamed appendix: There were 323 consecutive appendices studied, 219 males and 104 females. The positions of the inflamed appendices were as follows: retrocaecal 56.7% (183/323), pelvic 20.4% (66/323), preileal 6.2% (20/323), postileal 4.6% (15/323) and paracaecal 12.1% (39/323) (Table 3).The relative positions in both sexes were quite similar (Table 4); the retrocaecal position in males and females was 57.1% and 55.8%, and the pelvic position 21% and 19.2%.

DISCUSSION

Determining the position of the appendix at post-mortem is a reliable way of determining its true location. Although many descriptions of the position of the appendix have been given, this study limited itself to five locations and all positions described under these: retrocaecal, pelvic, preileal, postileal and paracaecal (that included the subcaecal position). In this study, the retrocaecal position was confirmed to be the most common position. This position occurred in 67.3% of Ghanaians, compared to the 74% widely quoted in Western literature (1,7). The pelvic position was the second most common position, occurring in 21.6% of Ghanaians, very similar to the 20% quoted in Western literature (7). The preileal and postileal positions together were found in 8.7% of Ghanaians compared to 6% from Western texts.

Previous studies in Africa show a wide dissimilarity in the positions of the appendix in autopsies. One of the first reports of its position in 125 Nigerian autopsies reported retrocaecal and pelvic positions of 38.4% and 31.2 % respectively (21).

In 103 Zambian cadavers studied in 1979 the retrocaecal and pelvic positions were 20.3% and 43.6% respectively (13). The reason for the differences in position of the appendix in different countries is not known and needs to be researched further.

In this study there were no differences in the normal position of the appendix between the sexes. The location of the appendices of males and females were found to be very similar in all five positions (Table 2). Since appendicitis in Accra is more than twice (2.6:1) as common in males as in females (1-3) it can be concluded that the position of the appendix is not a contributory factor in the difference in incidence of appendicitis between males and females.

The disparity in position frequency of the inflamed and normal appendix has been observed in previous publications (4,5,11,14). In many of those series (4,5,11) the incidence of the retrocaecal appendix was higher at autopsy (normal) than at surgery (inflamed). It has therefore been postulated that the retrocaecal position is less prone to inflammation (11). In this study the retrocaecal position was found in 914/1358 normal cases and 183/323 inflamed cases. Comparing non-retrocaecal to retrocaecal appendices by chi-square (Epi Info 2000) there is an odd's ratio of 1.57, indicating the non-retrocaecal appendix was 1.57 times more likely to be inflamed. There is a chi square value of 13.05 with a p-value <0.001, thus showing the retrocaecal appendix less prone to inflammation.

CONCLUSION

The positions of the appendix in a large sample of 1358 autopsies shows that the retrocaecal followed by the pelvic are the most common in Ghanaians. The frequencies are slightly different from findings in Western literature. Comparing non-retrocaecal to retrocaecal appendices there is an odd's ratio of 1.57 and a p-value of < 0.001. This study supports the hypothesis that "The retrocaecal appendix may be less prone to inflammation". A much larger sample of inflamed appendices will help establish whether indeed the retrocaecal position offers protection against appendicitis in Ghanaians.

There is no difference in position frequency of the normal appendix between the two sexes, which means the position of the appendix is not responsible for the known difference in incidence (2.6:1) between males and females in Ghana.

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A total of 107 (46.8%) patients had ophthalmic pathologies. However only 18 (7.9%) patients had E.N.T related ophthalmological complications namely proptosis six (2.6%), proptosis/restrictive myopathy ten (4.4%), visual loss five (2.2%) and enophthalmus one (0.4%) (Table 2). Twelve were females and six were males. Table 3 shows the age distribution of patients with E.N.T related ophthalmic pathologies. Non E.N.T related ophthalmological diseases were as follows vernal conjunctivitis 35 (15.28%) keratoconjunctivities 14 (6.11%,) refractive error 17 (7.42%) cataract 7 (3.06%) bilateral maculopathy 6 (2.62%) physiological cupping 11 (4.80%).

Table 1

Age distribution of patients with nasal, paranasal sinuses diseases and head and neck tumours

Age (years)	No.	(%)
0-9	21	9.2
10-19	50	21.8
20-29	75	32.8
30-39	32	14.0
40-49	20	8.7
50-59	22	9.6
60-69	6	2.6
>70	3	1.3
Total	229	100

Table 2

Ophthalmological complications in nasal/paranasal sinuses diseases and head and neck tumours

Ophthalmological complications	ENT	Diseases	Total	(%)
Proptosis	NPC	3	6	2.62
	NPP	2		
	MXC	1		
Proptosis/restrictive Myopathy	NPC	3	10	4.36
	NEC	2		
	MCCL	1		
	NPP	2		
	CIS	2		
Visual loss	NPC	3	5	2.18
	MCCL	I		
	ATR	1		
Enophthalmos	NPC	1	1	0.4

NPC = Nasopharyngeal carcinoma, MXC = Maxillary carcinoma, NEC = Naso-ethmoidal carcinoma, MCCL = Mucocoele, NPP = Nasal polyp, CIS = Chronic infective sinusitis, ATR = Atrophic sinusitis

Table 3

Age distribution of patients with ENT related ophthalmic complications

Age (years)	No.	(%)
0-9	–	–
10-19	6	2.62
20-29	4	1.75
30-39	3	1.31
40-49	4	1.75
50-59	–	–
60-69	–	–
>70	1	0.44

Radiological findings of the paranasal sinuses and base of the skull were reported as follows (Table 4). Mucosal thickening of the sinuses in 34.9%, sinus opacity in 14.7%, haziness in 18.8%, air fluid level in 2.2%, and normal sinuses in 19.2%. Destruction of the laminae papyracea with/without adjacent bony wall was reported in 4.6% in patients with fronto-ethmoidal mucocele, chronic infective sinusitis, nasoethmoidal and maxillary carcinoma. Destruction of the petrous apex by nasopharyngeal tumour was reported in 2.6%. Radiologically, maxillary sinus was reported with diseases in 32.6%, ethmoid sinus in 7.4%, frontal sinus in 4.4% maxillary/ethmoid in 16.5%, maxillary/sphenoid in 2.2%. ethmoid/frontal 4.8% and pansinuses in 8.7% (Table 5). The oncological patients in addition had computerised tomogram done.

Medical treatment applied for sinusitis patients according to the aetiological factors were antibiotics, anti-allergic drugs nasal spray-containing steroid in cases of allergy, vasomotor rhinosinusitis and nasal polyps. Surgical intervention employed in the management of these patients were antral washout in 2.2%, intranasal polypectomy in 4.4% of those patients that do not respond to medical treatment, fronto-ethmoidectomy 0.4%, intraturbinal steroid injection in 1.3%. Radiotherapy was employed for patients with nasoethmoidal carcinoma, maxillary carcinoma, and nasopharyngeal carcinoma. Those nasopharyngeal patients with intracranial extension had adjuvant chemotherapy. Only one patient had maxillectomy done for maxillary carcinoma.

Table 4

Radiologic diagnosis of sinus involement

Sinuses	Acute	Chronic	Nasal polyp	Frontoethmoidal Mucocele	Nasoethmoidal Carcinoma	Maxillary Carcinoma
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Maxillary		50 (21.8)				5 (2.1)
Ethmoid	10 (4.4)	5 (2.2)	20 (8.7)		2 (0.8)	
Frontal		10 (4.4)				
Maxillay/Ethmoid	6 (2.6)	24 (10.5)	7 (3)			1 (0.4)
Maxillary/Sphenoid		5 (2.2)				
Ethmoid/Frontal		10 (4.4)		1 (0.4)		
Pan-sinuses		20 (8.7)				

Table 5

Radiologic features of sinuses and base of the skull

Sinuses	Acute	Chronic	Nasal polyp	Frontoethmoidal Mucocele	Nasopharyngeal Carcinoma	Nasoethmoidal Carcinoma	Maxillary Carcinoma
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Normal		30 (13.1)	14 (6.1)				
Opacity	6 (2.6)	15 (6.6)	4 (1.7)	1 (0.4)	17 (7.4)	2 (0.8)	6 (2.6)
Haziness	10 (4.4)	24 (10.5)	9 (3.9)				
Mucosal thickening		80 (34.9)					
Air fluid level		5 (2.2)					
Destruction of the laminae or adjacent bony wall or base of skull				1 (0.4)	6 (2.6)	2 (0.8)	5 (2.2)

DISCUSSION

In recent years ophthalmological complications arising from nasal, paranasal sinus diseases and head /neck tumours are becoming rarely seen, this is so because the commonest cause of orbital involvement is from sinusitis though increasing in incidence and prevalence (3) has resulted in less ophthalmological complications due to availability and access to antibiotics. In this study acute sinusitis was recorded in 6.9% of the patients mainly in children less than 15 years of age and it was infective in origin while the remaining few were in adults above 20 years mainly due to allergy superimposed with infection. Unlike in other studies (10) where chronic infective sinusitis which is more likely to result in ophthalmologic complications predominate, chronic allergic sinusitis (41.9%) predominate in this study and another previously reported study (3) from this center. The ophthalmological complications of this type of sinusitis are few, mainly optic neuritis and optic atrophy. One (0.4%) patient with chronic allergic sinusitis developed atrophic trinities and optic atrophy and blindness. Mucocele as a complication of sinusitis is not commonly seen in our center, compared to Ibadan in Western Nigeria where pollens and dews from deciduous plants are common unlike the cosmopolitan city of Lagos.

Although majority (88.2%) of patients presented primarily in the E.N.T clinic, a thorough understanding of ophthalmological manifestations of E.N.T diseases and high index of suspicion is needed to avoid misdiagnosis that can result in delay to institute appropriate treatment which will consequently result in fatal complication.

The ophthalmological complications of nasopharyngeal carcinoma (NPC), nasoethmoidal carcinoma and maxillary antral carcinoma are well

documented (12-17). Nasopharyngeal carcinoma is one of the commonest carcinoma in our center, the inconspicuous and endophytic nature of the tumour and the late presentation accounts for most of the ophthalmological complications (16,17,20). However patients in our center still present early compared to Martinson's report (17). The implication of the ophthalmological involvement predicts an intracranial and advanced diseases. Proptosis alone (1.3%), proptosis with restrictive myopathy (1.3%), visual loss (1.3%) of which two were bilateral and one unilateral and enophthalmos (0.4%) was seen in some of the NPC patients.

Iatrogenic ophthalmological injury was not recorded during this period. Traumatic injury to the naso-ethmoidal complex resulting in chronic infective sinusitis complicated with granulation tissues and destruction of lamina papyracea and restrictive proptosis was seen in two (0.8%) patients due to chronic infection resulting from delay in presentation.

In conclusion, ophthalmological complications arising from infective nasal and paranasal sinus diseases which few years ago were commonly seen, seems to be on the decline. Sinusitis though increasing in prevalence has resulted in less ophthalmological complications due to availability and access to antibiotics. Nasopharyngeal carcinoma, maxillary and naso-ethmoidal carcinoma are still prevalent with ophthalmological complications due to late presentation. Patients with diseases of the nose, paranasal sinuses and head neck tumours should routinely have visual acuity and other visual assessments as part of their management protocol.

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