ABDOMINAL SYMPTOMS IN ACUTE RHEUMATISM

BY

J. J. J. GIRALDI, M.B., Ch.B.

(From the University Centre of Cardiac Research, Bristol.)

The object of this paper is to record a few cases which have seemed interesting in view of the recent literature, mainly from foreign observers, on the subject of abdominal manifestations of acute rheumatism ; at the same time attempting to review briefly the literature on the subject.

In recent treatises on medicine, no matter how exhaustive, there is little note of any digestive or peritoneal symptoms in acute rheumatism. To the older writers, however, these were well known and were made the subject of treatises, on which much debate arose. This subject may be said to have passed through three phases. The first was that in which it was well known, much commented upon, and no doubt exaggerated ; then came a period notable for its absence from the literature ; and recently an awakening interest on the subject.

In 1635, Ballonius¹ in his work distinguishing acute rheumatism from gout, mentions digestive symptoms as occurring in acute rheumatism, which he regarded as beneficial, especially the diarrhoea, attributing to it the fact that 'elle dissipe les humeurs.' Boerhaave², amongst the innumerable forms of acute rheumatism which he described, gave prominence to digestive forms. Too much weight need not, however, be placed on these early observations, for it is well known that in those times every symptom-complex for which a cause could not be assigned was labelled 'rheumatism.'

A treatise by Huxham³ in 1730 contained the first detailed description of the abdominal localization of symptoms. He described stomach pains with sickness and diarrhoea followed by the usual symptoms of acute rheumatism as we know it to-day.

Stoll⁴, in his 'Médecine Pratique,' wrote that he had observed innumerable cases of acute rheumatism and drew far-reaching conclusions which have appeared as exaggerated to other writers. Here we come to a period in which little record is found on this subject in the literature.

Grifoulhière⁵ noted an enteric form of rheumatism in 1841. In his thesis on rheumatism, Chomel⁶ described meteorism and diarrhoea as well-recognized symptoms. Trousseau⁷ and Peter⁸ mentioned diarrhoea as of common occurrence at the onset of an attack of acute rheumatism.

In 1880 appeared Lambin's⁹ Thèse de Paris on the subject. He concluded that acute rheumatism can localize itself anywhere in the digestive tract with predilection for the intestine, the expressions thereof being colic, colic and diarrhoea, or diarrhoea by itself ; and that these may precede, follow, or alternate with other rheumatic manifestations.

Homolle¹⁰, in his work on Medicine, devotes a chapter to the digestive complications of rheumatic fever and considers diarrhoea to be common.

Lately, Grenet¹¹, has devoted many articles to this subject. To these, and others from various authors, which have appeared recently, reference will be made subsequently.

In this paper it is intended to discuss the subject from three aspects ; those of a digestive group, a group simulating acute appendicitis, and lastly a group with a peritonitic picture. It must be admitted that this division, though practicable in many cases, is arbitrary in others.

Digestive group.—The frequency of digestive troubles in young subjects is so pronounced as to make difficult the assessment of their rheumatic nature. Nevertheless, cases are seen now and then in which the sequence of events is such as to make it plausible to attribute to acute rheumatism several digestive disturbances.

The following cases, seen recently, have appeared interesting in this respect.

Case 1.—H. M., male, aged 13. Admitted 6 years ago with a history of 4 days' illness with vomiting, headache and epigastric pains. He then developed pains in the limbs; there was cardiac enlargement; and an apical systolic bruit appeared. He was discharged after four weeks. On January 28th, 1930, he was re-admitted with abdominal pains and frequent vomiting for one week, followed by pains in the limbs. He had now considerable cardiac enlargement, and signs of a mitral and aortic lesion. Here, therefore, a recurrence of abdominal symptoms was followed by a recrudescence of acute rheumatism.

Case 2.—K. F., female, aged 18. Eight months ago she suffered from sudden vomiting, abdominal pain and diarrhoea; this attack was severe enough to cause her to seek medical advice. After a few days it subsided and pains in several joints appeared, and a mitral systolic bruit developed. Since then the patient has had several bouts of abdominal pain with no relation to food, nausea was present often, vomiting sometimes, usually at an interval of two weeks or less, sometimes accompanied by looseness of the bowels, at other times by constipation. No cause for the abdominal pain was discovered after a thorough search, and in view of the relation between the first attack and the subsequent acute rheumatism, salicylates were given with success. She has had no pain for eight weeks.

Case 3.—A. W., female, aged 12. In May, 1930, she was admitted with acute rheumatism. The articular phenomena had abated somewhat on admission. There was some enlargement of the heart with accentuated impulse, and a loud mitral systolic bruit, with accentuation of the second sound at the pulmonary area. Four days previous to her illness she was suddenly taken with abdominal pain, nausea and vomiting (twice), also diarrhoea. These subsided just before the joint pains were felt. She had had 'bilious attacks' before but never so severe. It is interesting to note that the cardiac lesion appeared to be of some standing.

Case 4.—C. S., male, aged 9, was brought to the out-patient department two months ago, complaining of abdominal pain and looseness of the bowels. On enquiry, it was found that he had suffered from pains in the limbs for some time previously. He was now suffering with acute carditis; the temperature was 99.5° and the pulse 92; complexion very pale. The heart's impulse was diffuse but forcible, just outside the mid-clavicular line in the fourth space. There was enlargement of the heart to right and left, with a loud systolic and faint mid-diastolic bruit at the apex.

Cases such as these have been recorded by several authors, who regard the digestive symptoms as part of the rheumatic infection.

In 1894 Hanot¹¹ and Lyman¹² wrote on these. The latter labelled these symptoms 'gastro-enteric rheumatism.' He considered the different abdominal manifestations as due to the selective action of toxins in the tissues. If the muscular layer of the stomach was involved, there was pain due to cramp, whereas if the secretory nerves were affected there was pyrosis, hyperchlorhydria, and diarrhoea, or a combination of these.

Dory¹³ believed that digestive symptoms are found in a considerable number of cases if they are looked for. Diarrhoea he considered the most frequent symptom, occurring in about 33 per cent. of cases, *i.e.* as frequently as tonsillitis. As a rule it is prodromal and lasts from five to ten days before the onset of arthritis. Dory found it in 9 out of 26 cases.

Libman¹⁴ in a review of the various symptoms of rheumatic fever, wrote that abdominal symptoms occur frequently, diarrhoea being the most frequent in some endemics. He quoted the same proportion as Dory. Herman¹⁵ in his 'Thesis on Extra-articular forms of Acute Rheumatism,' stated that digestive symptoms often accompany the other manifestations.

* Poynton¹⁶ writing on acute rheumatism in childhood notes that vomiting, diarrhoea, chilliness and prostration may occur at the onset of an attack.

On looking through the records of the last hundred cases of acute rheumatism admitted to this hospital, it was found that digestive symptoms were rarely noted. In a few cases there were vague isolated symptoms, such as abdominal pain during the attack. These, of course, might have been due to other causes, such as an enlarged and painful liver, pericarditis, or an arthritis of the hip joint, or even salicylate medication. No purpose would be served by laying stress on past records, taken by those who were unaware of the significance of such symptoms, and might fail to inquire for them or neglect to report them even if mentioned. Also, parents and patients alike tend to regard such symptoms as 'bilious attacks,' unworthy of the notice of the doctor. On the other hand, there is no doubt that, if enquiry is made, such symptoms will be found to be of not rare occurrence, as is shown by the fact that the five cases recorded above were all seen within a period of six months.

It would obviously lead to adverse criticism to state that a digestive upset in a rheumatic subject is in most or all cases due to the rheumatic infection; it is only when the sequence of events is such that a digestive outburst precedes an attack of acute rheumatism, that it is logical to presume that the two phenomena are related.

If such is the case, it would be unprofitable to state figures as to their frequency until a considerable number of cases have been seen and carefully inquired into. It is as a prodromal phase that these symptoms must be regarded and sought for; once the arthritic and cardiac phenomena are manifest we must not expect to find them.

The importance of these alimentary tract symptoms lies in relation to the pathogenesis of the disease. It might lead to a search in the intestinal wall for information which has been unsuccessfully sought for in the tonsils and elsewhere.

Pseudo-appendicular group.—In this group the possible rheumatic origin of appendicitis requires discussion.

Case 5.—B. T., female, aged 8. Admitted January 26th, 1930, after being ill for four days with abdominal pain and sickness; the pain was at first generalized but became more pronounced in the right iliac fossa on the day of admission. She vomited three times on this day; bowels opened two days before admission and not since. On examination: temperature, 100.2°; pulse 138; respirations 30. Tongue furred, fauces clear. The abdomen moved freely on respiration. There was tenderness and rigidity, localized to the right lower quadrant of the abdomen. Rectal examination revealed tenderness on right side. The appendix was removed; on section, save for some slight oedema, it showed nothing gross. There was no evidence of tuberculosis, etc. On January 30th the child complained of pain in the left wrist; the wrist was slightly red and tumid. On the next day the right wrist was similarly affected. A systolic bruit appeared in the mitral area on February 1st. For two weeks after this the child ran a temperature of 100° to 101°, with a frequent pulse. The wound discharged for a few weeks after operation, though at the time of the operation there was nothing to suggest this possibility. On discharge, seven weeks after admission, there was some cardiac enlargement and a mitral systolic bruit.

This case lends itself to some comment. It did not appear to us that the condition of the appendix was sufficient to account for the general disturbance. Is this, however, a case of appendicitis and, if so, are we justified in regarding it as a case of rheumatic appendicitis?—or is the diagnosis of appendicitis

untenable in view of the findings, and should the symptoms be regarded as a severe form of the previous group with special predilection for the right iliac fossa ?

The ætiological relationship between appendicitis and acute rheumatism was one of frequent comment by older writers, and in the literature of the latter part of the last century there is frequent allusion to their connection.

Sir James Grant¹⁷ in 1893, and Burney Yeo¹⁸ in 1894, recorded clinical accounts of cases of appendicitis which they attributed to rheumatism. Haig¹⁹ also reported several cases of perityphlitis which he regarded as rheumatic and gouty in origin, and treated successfully with salicylates. He believed that the action of uric acid on the fibrous tissue of the appendix caused appendicitis, a belief which has not been supported by further experience.

Of all English writers Sutherland²⁰ seems most convinced of the rheumatic origin of appendicitis. He pointed out that in many cases of appendicitis there was a well-marked family history of acute rheumatism. Also the usual manifestations of rheumatism, such as arthritis, endocarditis, tonsillitis, etc., are not uncommon in patients with appendicitis. He recorded six cases all indicative of this association.

Beverley Robinson²¹ and Brazil²² also wrote in support of the view. Finney and Hamburger²³ reported three interesting cases as examples of the relationship between the two diseases. Moffet and Rodgers²⁴ described two cases of rheumatic fever simulating appendicitis; in these cases no operation was performed and salicylates were used with good results. They apparently regarded the abdominal symptoms as part of the rheumatic infection and not as a genuine appendicitis. Grenet²⁵ has during the last few years described several cases demonstrating the simulation of appendicitis by rheumatism. He is convinced that acute rheumatism may be ushered in by a pseudo-appendicular syndrome.

Other cases have been reported by Dory¹³, Chauffard²⁵, and Bezancon and Weil²⁷.

As experimental evidence we have the work of Poynton and Paine²⁸. They were able to produce pathological lesions in the appendix by injection with their diplococcus. These lesions resembled those found in appendicitis in man and were obviously blood-borne. They point out that the occurrence of multiple arthritis, coincident with or shortly after an attack of appendicitis, may be metastatic or pyæmic. This usually follows a mild attack as, if the attack is severe, perforation or recovery after operation ensues.

We are confronted with two explanations for these cases; that appendicitis may be caused by acute rheumatism, or that rheumatism may cause symptoms simulating an appendicular inflammation.

The frequent incidence of acute rheumatism on the faucial tonsils and the anatomical similarity between these and the vermiform appendix appears to lend support to the former view. Bland Sutton²⁹, writing on the anatomy of the appendix, emphasizes its richness in lymphoid tissue and regards it as the abdominal tonsil. It is not irrational, therefore, to suppose that it may become involved in a disease which so frequently invades the faucial tonsil.

It is admitted that in many cases of appendicitis the theory of local causation does not seem to apply as far as any positive evidence exists; it seems only rational to inquire whether constitutional agencies may not be concerned in the production of such cases, and that an attack by a constitutional disease may pave the way for a subsequent infection. Tripier and Paviot³⁰ urged that in appendicitis a general infectious origin should be more frequently recognized.

Kelly and Hurdon³¹ in their monumental work on appendicitis discuss the subject and come to the conclusion that clinical evidence is in favour of an intimate relation between appendicitis and acute rheumatism, and that animal experiments and clinical experience support the view of a general infection as

a frequent exciting cause in appendicitis. Nothnagel³² noted that it is conceivable that some cases of appendicitis begin as a rheumatic inflammation and subsequently become infected with other micro-organisms. Against this view we have the experience of many authorities. Edwards³³ collected considerable information by personal communication and sums up against the relationship between the two diseases in question. Poynton³⁴ also came to the same conclusion. Morris³⁵ does not attach any influence to rheumatism as a cause of appendicitis. The probability of coincidences between two diseases of common occurrence must not be lost sight of.

That the arthritis following appendicitis is pyæmic in origin is possible in some cases, but this view will not hold in those cases where multiple arthritis and evidences of a cardiac lesion develop, which subsequently become chronic and present all the features of a rheumatic infection of the heart.

It has also been alleged that involvement of the hip joint by acute rheumatism may simulate appendicitis. In some of the recorded cases, those of Moffett and Rodgers²⁴ for example, the hip joint was involved, but this possibility is excluded in all the other cases, where no involvement of the hip joint was noted. But perhaps most significant of all is the fact that though many cases of so-called appendicitis are recorded, in only a few was operation resorted to and in none of these was there found in the appendix a lesion sufficient to justify surgical interference, certainly nothing resembling the experimental lesions produced by Poynton and Paine²⁸ in animals.

It must be admitted that our case described above was probably not appendicitis at all, but a simulation of appendicitis by the rheumatic infection. It is safe to conclude that in some instances acute rheumatism may give rise to abdominal symptoms simulating appendicitis, but that at present there is no warrant for the use of the term rheumatic appendicitis.

Peritoneal group.—In the following case a suspicion of rheumatic peritonitis arises.

Case 6.—E. B., male, aged 9. Admitted June 16th, 1929, with a history of frequent vomiting and acute abdominal pain for the last 30 hours. The temperature was 99.8° and the pulse 132, of poor volume. On examination, the tongue was furred; the abdomen moved little on respiration; there was generalized guarding and tenderness. Rectal examination revealed tenderness. Peritonitis was diagnosed and the abdomen was opened. The appendix was normal in appearance and there was free fluid in the peritoneal cavity. There was no evidence of tuberculosis in peritoneum or glands. Appendicectomy was performed. No lesion was found in the appendix on section. The temperature and pulse-rate remained raised after the exploration. Ten days later the temperature rose to 103°, multiple arthritis ensued, and a mitral systolic bruit was discovered. The condition subsided under treatment with salicylate. Recently this child has been seen with some cardiac enlargement and an apical systolic bruit.

Cases such as this are not unknown.

Tricot³⁶ described a case with a similar onset which, on operation, showed some clear serous fluid in the peritoneum, and a few days later polyarthritis, with a mitral systolic murmur, appeared. This case had two subsequent relapses of polyarthritis, both accompanied by abdominal symptoms which were relieved by salicylate.

* Since writing this, my friend, Dr. H. D. Pyke, has brought to my notice a somewhat similar case, of a patient with chronic cardiac rheumatism who had a severe abdominal crisis and on exploration nothing but some serous fluid in the peritoneum was found.

Garrod³⁷ has said that though many recorded cases of rheumatic peritonitis are open to question, there are a few which seem hardly to admit of any other interpretation than that the peritoneal inflammation formed an integral part of an attack of rheumatic fever. He recorded three cases previously described by Fuller³⁸, Marmonnier³⁹ fils and Blachez⁴⁰. These three cases agreed in that in all of them there were grave pulmonary lesions. An autopsy was performed in Fuller's case, which showed bands of recent lymph together with turbid serum in the peritoneal cavity.

Garrod³⁷ gave several references to relevant literature, such as that of Chauffard²⁶, Desplets⁴¹, Andral⁴², Morin⁴³, etc. Grenet has lately described two cases of this type. Pilod and Meersmann⁴⁴, and Bernard⁴⁵ describe cases of young soldiers with severe abdominal pain, fever, and fleeting arthritis. At operation nothing but a congested peritoneum was found. One of Pilod and Meersmann's cases later developed pericarditis and aortic incompetence. Costedoat⁴⁶ describes another case and points out the difficulty of diagnosis and the possible fixation of virus in the abdominal wall.

Worms⁴⁷ has observed three cases of this nature, all of them submitted to operation, in one of which there was free fluid in the peritoneal cavity. He gives a brief account of several cases reported by some of the authors already mentioned, and interprets them, in view of the operation findings of exudation and congestion, as a primary infection of the peritoneum.

Quite recently Auvray⁴⁸ observed a case of a child presenting signs of peritoneal inflammation. Operation revealed serous fluid in the peritoneum. Bacteriological examination of this fluid proved negative. Blood culture was also negative. Ten days later the child developed arthritis and pericarditis which responded to salicylate medication. Howard⁴⁹ in Pepper's 'System of Practical Medicine' says that he has but once met with a case of acute peritonitis as a complication of acute rheumatism.

Bauer⁵⁰, in Ziemssen's 'Cyclopedia of the Practice of Medicine' says that rheumatic peritonitis is undoubtedly an exceedingly rare complication of acute rheumatic fever.

In their article on peritonitis in the 'Dictionnaire Encyclopedique des Sciences Medicales,' the authors⁵¹ point out that all degrees of rheumatic inflammation of the peritoneum may occur, from simple hyperaemia with very little exudation to fibrinous purulent or hæmorrhagic exudation.

Allehin and Andrews⁵² in their article on peritonitis regard the association of peritonitis with acute rheumatic fever as an extremely rare occurrence.

Our case described above, which we regard as an example of a peritoneal reaction to an infection, needs little comment. The abdominal symptoms were such as to make urgent operation justifiable and yet exploration revealed but serous fluid in the peritoneal cavity. In view of the subsequent outburst of acute rheumatism it is very tempting to ascribe this serous peritonitis to acute rheumatism. This view, as already mentioned, has been adopted by others who have met with similar cases.

It has been taught and accepted that the peritoneum is almost, if perhaps not quite, invulnerable to invasion by the rheumatic virus. This immunity of the peritoneum is an inexplicable anomaly in view of the proclivity of the other serous membranes. But, it may well be that this immunity is more apparent than real. The peritoneal cavity, owing to its capacity, may hold an appreciable amount of exudate without its presence being revealed or easily ascertained. In two recent cases of acute rheumatism we have convinced ourselves of the presence of fluid in the peritoneal cavity. These have been very severe examples of the disease in young subjects. In both of these there was

¹⁴ * A localised peritonitis of the subdiaphragmatic region has been described, amongst others, by Rolly⁵³, Coombs⁵⁴, Poynton¹⁶ and Paul⁵⁵. Paul gives a full account of such a case and brings forward postmortem and histological evidence of the rheumatic nature of the condition.

some tenderness over the abdomen, not an uncommon finding in these cases with a massive dose of infection. It is true that such tenderness may be due to a pericarditis, an enlarged liver, or even to the usual attendant constipation, but the presence of a peritoneal reaction may well be worth considering. It has been tentatively suggested by some that a peritonitis during the course of acute rheumatism may be due to some local lung or pleural lesion whence infection through the diaphragm may take place. This is possible but not probable. The spread of infection is, as would be expected from the lymphatic anatomy of this region, in the opposite direction. Rarely does a virulent and even long standing empyema give rise to general peritonitis. Furthermore, in many cases of so-called rheumatic peritonitis, there has been no demonstrable pulmonary lesion either clinically or post mortem.

It may be concluded that an acute peritonitis, one which assumes importance in view of the difficulties it presents in differential diagnosis, at the onset of an attack of acute rheumatism, is a rare phenomenon; one of the rarest manifestations of this disease. On the other hand, it is urged that the frequency of a peritoneal reaction with evidence of exudation, during the course of a severe attack of acute rheumatism, has been underestimated and is worthy of future consideration.

Conclusions.

The following conclusions are submitted:—

1. Digestive symptoms precede the onset of acute rheumatism more often than is at present realized.
2. There is, so far, no warrant for the use of the term rheumatic appendicitis, but in some cases acute rheumatism appears to give rise to symptoms simulating an acute appendicular inflammation.
3. Acute peritonitis at the onset of an attack of acute rheumatism is a very rare phenomenon; but there is not infrequently, in acute cases, evidence of invasion of the peritoneum by the rheumatic virus.
4. These abdominal manifestations of acute rheumatism are of importance chiefly by reason of the help that they may afford to a study of the pathogenesis of that infection.

REFERENCES.

1. Ballonius, G., *Œuvres Posthumes*, Paris, 1635.
2. Boerhaave, H., *Aphor. de cognoscendis et curandis morbis usum doctrinae medicae*, 1709, V.
3. Huxham, J., *De Aëre et morbis epidemicus*, 1730.
4. Stoll, M., *Ratis Medendi. Médecine Pratique*, trans. by Mahon, Paris, 1809.
5. Grifoulhière, J., *J. des connaissances méd.-chir.*, Paris, 1841.
6. Chomel, A., *Thèse de Paris*, 1880.
7. Trousseau, A., *Clinique Méd. de l'Hôtel Dieu.*, Paris, 1873, III.
8. Peter, M., *Lesions de Clinique Méd.*, Paris, 1873, I.
9. Lambin, C., *Thèse de Paris*, 1880.
10. Homolle, A. E., *Nouveau Dict. de Méd. Prat.*, Paris, 1882.
11. Hanot, V., *Presse méd.*, Paris, 1894, II, 171.
12. Lyman, H., *Trans. Ass. Amer. Phys.*, Phil., 1894, IX, 237.

13. Dory, E., *Thèse de Paris*, 1925.
14. Libman, E., *Trans. Ass. Amer. Phys.*, Phil., 1928, XLIII, 188.
15. Herman, P., *Thèse de Paris*, 1929.
16. Poynton, F. J., *Dis. of Child.*, Garrod et al., Lond., 1929, 875.
17. Grant, J., *N.Y. Med. Rec.*, N.Y., 1893, II, 609.
18. Yeo, I. Burney, *Brit. Med. J.*, Lond., 1894, i, 1289.
19. Haig, A., *Practitioner*, Lond., 1893, i, 17. *Brit. Med. J.*, Lond., 1894, i, 1413.
20. Sutherland, G. A., *Brit. Med. J.*, Lond., 1892, i, 857. *Lancet*, Lond., 1895, ii, 457. *Edin. Hosp. Rep.*, Edin., 1895, 109.
21. Robinson, B., *N.Y. Med. Rec.*, N.Y., 1893, II, 373.
22. Brazil, W. N., *Brit. Med. J.*, Lond., 1895, i, 1142.
23. Finney, J. M. and Hamburger, L. P., *Amer. Med.*, Balt., 1901, II, 941.
24. Moffett, R. & Rodgers, M., *Arch. Ped.*, N.Y., 1924, XLI, 431.
25. Grenet, H., *Progrès Méd.*, Paris, 1925, 422.
 ,, and Delalande, J., *Arch. méd. d. enfants*, Paris, 1928, XXXI, 453.
 ,, *Presse méd.*, Paris, 1930, XXXVIII, 353.
26. Chauffard, E., *Arch. Gen. Méd.*, Paris, 1863, S. vi, I, 641.
27. Bezancon, F. & Weil, M. P., *Ann. de méd.*, Paris, 1926, XIX, 184.
28. Poynton, F. J. & Paine, A., *Researches on Rheumatism*, Lond., 1913, 359.
29. Bland Sutton, J., *Lancet*, Lond., 1891, i, 545.
30. Tripiet, R. & Paviot, J., *Lem. Méd.*, Paris, 1899, LVII, 73.
31. Kelly, H. and Hurdon, E., *Vermiform Appendix and its Dis.*, Phil., 1905, 381.
32. Nothnagel, H., *Encyc. Pract. Med.*, Phil., 1904, 837.
33. Edwards, W. A., *Amer. Med.*, Balt., XXX, 595.
34. Poynton, F. J., *Trans. Med. Soc. Lond.*, Lond., XXIV, 22.
35. Morris, R. T., *Lectures on Appendicitis*, N.Y., 1899, 16.
36. Tricot, *Gaz. des Hôp.*, Paris, 1908, LXXXI, 1264.
37. Garrod, A., *Treatise on Rheumatism*, Lond., 1890, 169.
38. Fuller, H. W., *Rheumatism, Gout & Sciatica*, Lond., 1860, 324.
39. Marmonier, (fils) *Lyon Méd.*, 1893, II, 476.
40. Blachez, *Gaz. Hebdom. de Med. et Chir.*, Paris, 1874, II, 505.
41. Desplats, H., *Union Méd.*, Paris, 1873, 169.
42. Andral, G., *Clinique Méd.*, Paris, 1831, IV, 548.
43. Morin, *Gaz. des Hôp.*, Paris, 1873, 414.
44. Pilod & Meersmann, *Soc. de méd. mil. franc.*, *Bull. mens.*, Paris, 1928, XXII, 121.
45. Bernard, L., *Loc. cit.*, 46.
46. Costédoat, *Bull. et Mem. de la Soc. Méd. des Hôp. de Paris*, Paris, 1929, LIII, 1353.
47. Worms, G., *Bull. et Mem. de la Soc. Nationale de Chir.*, Paris, 1930, LVI, 457.
48. Auvray, *Loc. Cit.*, 548.
49. Howard, R. P., *Pepper's System of Pract. Medicine*, Lond., 1885, II, 42.
50. Bauer, J., *Ziemssem's Cyclopaedia of Pract. Med.*, Lond., 1877, VIII, 222.
51. Spillmann & Ganzinotty, *Dict. Encyclop. des Sciences Méd.*, Dechambre & Lereboullet, etc. 1887, XXIII, 310.
52. Allchin, W. H. & Andrewes, F. W., *Allbutt's and Rolleston's System of Medicine*, Lond., 1907, III, 900.
53. Rolly, F., *Der akute Gelenkrheumatismus*, Berlin, 1920.
54. Coombs, C. F., *Rheumatic Heart Disease*, Bristol, 1924, 71.
55. Paul, J. R., *Bull. No. 12 Ayer Clinic. Lab.*, *Penn. Hosp.*, Phil., 1930, June, 9.