

The Boston Medical and Surgical Journal

TABLE OF CONTENTS

March 24, 1921

ORIGINAL ARTICLES	EDITORIAL
WHEN TO OPEN KNEE-JOINTS. <i>By H. W. Marshall, M.D., Boston.</i> 291	BRIEF SUMMARY OF THE ANNUAL CONGRESS IN CHICAGO. 313
THE ENERGY REQUIREMENTS OF GIRLS FROM 12 TO 17 YEARS OF AGE (continued). <i>By Francis G. Benedict and Mary F. Hendry, Boston.</i> 297	MEDICAL NOTES. 315
A NOTE UPON THE PRODUCTION OF AGGLUTININS IN TYPHOID FEVER. <i>By Robert A. Kilduffe, A.M., M.D., Pittsburgh.</i> 306	OBITUARY
CLINICAL DEPARTMENT	WILLIAM FISKE WHITNEY, M.D. 316
ACUTE EMPYEMA COMPLICATED BY WHOOPING COUGH. <i>By William Reid Morrison, M.D., Boston.</i> 307	CORRESPONDENCE
MEDICAL PROGRESS	THE PREVENTION OF MALARIA. <i>By Beverley Robinson, M.D., New York.</i> 318
RECENT PROGRESS IN NEUROLOGY. <i>By Isador H. Coriat, M.D., Boston.</i> 308	AN EARLY SUCCESSFUL GASTROTOMY. <i>By William Pearce Coues, M.D., Boston.</i> 318
BOOK REVIEW	MISCELLANY
George Miller Sternberg: A Biography. <i>By Martha L. Sternberg.</i> 312	TYPHUS FEVER WARNING. 316
	SOCIETY NOTICES, RECENT DEATHS. 318

Original Articles.

WHEN TO OPEN KNEE-JOINTS.

BY H. W. MARSHALL, M.D., BOSTON.

A SURGEON might reply that knees should be opened whenever an operation will be of benefit. A very conservative non-operating physician might say that all other methods should be tried first.

Such differences of opinion are unavoidable because surgeons know favorable possibilities of operations most accurately and the limitations of other methods; while physicians who never operate know merits of non-surgical methods and disadvantages of operations especially. Both should be commended for their accurate special knowledge. If the ideas of both are collected, shuffled together, and all fitted carefully then on anatomical and physiological foundations without trying to show advantages of any special clinical method strikingly, there will result modified points of view of interest. The writer will try to deal briefly with a few common knee affections with this aim in view.

SYNOVITIS.

A tall, lean, muscular Dane fifty-one years old, cement finisher by trade, was at work on his hands and knees when suddenly he felt a sharp pain in one knee. He was in average

health at the time as far as he was aware, and he did not traumatize his knee except in rather rough usage of repeated kneeling. Pain persisted and the knee became swollen. He entered an excellent hospital and submitted to an arthrotomy six days after the onset of his trouble. The operation was done skillfully and consisted in making a large incision above the patella which permitted thorough examination of the joint and quadriceps pouch. More than five months after the operation when the writer first examined him there was normal motion practically in flexion and extension of the leg and no abnormal lateral mobility existed at the knee. The operation wound had healed perfectly with no stretching or adherence of the scar. There was no abnormal joint crepitus nor abnormal joint effusion. The capsule of the joint was not thickened, and on the whole the knee had a very normal appearance.

Is this result a decided success that shortened the course of joint inflammation, or should it be interpreted as undesirable treatment which disabled the patient a longer time than if he had not been operated on? His attitude now happens to be a dissatisfied one because his knee is still too sensitive to kneel on continuously, and because it gives out on descending stairs, so that he is unable to accept other work.

Statistics from series of clinical cases will not answer such a question as the foregoing one conclusively. There are some exceptionally brilliant results both in operated and non-operated groups, and differences between them are not convincing. Operations do not abort all cases quickly at least, and conservative physicians point out that many patients who refuse operations subsequently recover completely in approximately same lengths of times, as many of those who undergo surgical treatment. Yet, perhaps, such patients might have recovered even more quickly than they did if they had submitted to arthrotomies.

Anatomical and physiological considerations have to be turned to when indeterminate situations are encountered in clinical evidence. It is certain that arthrotomies accompanied by irrigations of joint cavities remove synovial accumulations that sometimes possess toxic properties. It is true also that irrigation fluids exert some physiological influence on synovial linings. Incisions into joints when the latter are distended with excess of synovial fluid relieve intracapsular pressures and tend to prevent capsular stretchings. These points will be discussed in turn.

Synovial accumulations may have two important actions. Increase of fluid separates synovial surfaces and protects them when in an irritated state by reducing mechanical frictions in subsequent joint movements. This is an extremely beneficial influence that is liable to be lost sight of among prominent pathological symptoms and signs. Accumulated synovial fluid contains toxic substances, without doubt, when it has a purulent character, and under these circumstances it exerts a mixed influence. In instances in which micro-organisms are not demonstrable in synovial fluids and which comprise a large percentage of cases, theoretically there may or may not be present toxic substances which have leaked through synovial capillaries out of toxic circulating blood. It is not known in the majority of clinical cases actually whether beneficial or harmful influences predominate in synovial accumulations.

If formations of synovial fluids are recalled, it will be remembered that serous fluids pass through capillary walls into connective tissue spaces. Connective tissues become oedematous and there may be proliferations of connective tissue elements if irritations are greatly prolonged.

Linings of joint cavities apparently exert selective actions on serous fluids because synovial contents are more than simple transudates. It would not be surprising if some protective action of synovial linings against passage of blood toxins into joints is found at some future time. Possibly toxins are partly restrained in connective tissue spaces out of reach of irrigating fluids, but nothing definite is known of existing conditions.

It is known that synovia resist a considerable amount of sepsis inside joint cavities successfully at times, so that joints may be closed tightly after washing them out, although some staphylococci have been present in the serous fluid.

Experiences with penetrating wounds of knee-joints in war injuries have shown surgeons repeatedly that many such knees can be left several weeks quietly, with profit, until joint resistances have increased.

Then joints can be opened, cleaned out, and closed, generally with best results; because synovial linings possess peculiarities analogous to those of peritoneal surfaces. Both are able to take care of variable amounts of internal septic irritation depending on the normal reactions of healthy tissues of healthy individuals.

Septic joints of pyaemic origin often are restored to normal function again to surprising degrees when joint drainage is avoided. Drainage is being found to be indicated less and less frequently.

When discharging joint sinuses exist, the utility of early, gentle massage, even during subsiding stages of acute inflammations, is becoming more widely recognized as such treatment is conducted skillfully in a manner to accelerate lymphatic circulation about inflamed regions.

Various details of surgical care of septic joints must be left, however, to papers that present convincing case reports.

Synovial fluid varies within wide limits. It may be clear and straw colored, or turbid with cell debris. It may contain fibrin in scanty quantities or in severe very chronic inflammations there may be loose jelly-like moulds of fibrin filling the joints. At times it has characteristics of an inflammatory exudate even consisting of frank pus. Synovial fluid normally contains salts, proteids, a mucin-like substance and water, and it has a variable specific gravity.

Irrigating fluids possess differing physiologi-

cal influences, depending on their chemical and physical properties, and practically there should be included with physiological influences of irrigations also mechanical frictions sustained in moving joints to and fro while attempting to introduce fluids into all parts of joint cavities. At times irrigations simply mean introductions of small streams that trickle out again promptly as small streams, without coming into contact generally with synovial surfaces. If irrigation fluids are of proper chemical natures and of right concentrations, of proper temperatures, and if they reach all parts without harmful mechanical irritations of joint surfaces, then the latter will be favorably stimulated, probably, by single applications to slight degrees. When synovial tissues already are struggling unsuccessfully with increasing blood-carried toxins, their resistances may become very low, and conceivably they may be embarrassed rather than slightly relieved by added influences of joint irrigations at these particular times, especially if the latter are not precisely correct in nature. Clinical evidence does not disprove that a large percentage of irrigations are useless or slightly harmful in their direct influences on synovial linings at onsets of inflammatory processes. In subsiding stages of acute synovitis, however, there is more data to base judgments on in estimating the advantages of arthrotomy. Tissue resistances then are increasing and some irrigations that might have been too strong for earlier stages are more liable to be favorable in their actions on more stable tissues. Explorations of joint cavities in subsiding or late stationary stages of severe synovitis furthermore permit removals of fibrinous clots that might lead to adhesions of serious nature, also they allow inspection of synovia at times when tubercular infections or villous hypertrophies are suspected.

Single irrigations in subsiding stages of synovitis with immediate subsequent closures of joints cannot produce very great influences. And irrigations of joints toxically irritated through the blood are in a different class from the repeated irrigations of septic joints when the latter have been caused by local infections from penetrating wounds.

Continued extreme capsular stretching by synovial accumulations should be prevented undoubtedly, in order to avoid subsequent laxities of ligaments as well as to prevent bacterial infiltrations of weakened joint capsules and subsequent chronic inflammatory

thickenings. Operations have distinct advantages over purely non-operative measures in this respect, but large accumulations can be kept down by aspirations and tight elastic pressures.

Defects of surgical technique occasionally occur and lead to impaired results of treatment, but these are too well understood to demand discussion. Surgeons realize that best results depend on most evenly balanced judgments exercised in all details of operative procedures. Poor results may be traced at different times to origins in any one of the minor steps of an operation, such as too extensive or too small incisions, handling of tissues, infections, suture material, drainage, control of hemorrhage, closure of incisions, post-operative care.

In the illustrative case that has been cited, the patient was dissatisfied because his knee was not dressed until seven days had elapsed after his operation. Then a large quantity of fluid squirted, so he states, from the operation wound when one end was purposely opened to liberate the subcutaneous accumulation of serum. He erroneously interpreted a good surgical practice as gross neglect.

Subcutaneous serous exudates may be derived, it should be recalled in passing, from reactions of tissues to surgical handling; also, possibly, to subsequent leakage from the joint cavity, and from rapid drainage of oedematous periarticular tissues.

It may be claimed by some surgeons that formations of sterile subcutaneous serous accumulations accelerate anatomical recoveries and tend to avoid capsular thickenings. Others may argue that there would be more rapid restorations of synovial functions with quicker subsidence of joint tenderness, as exhibited in the patient whose case has been cited, if synovial surfaces had been left more perfectly protected by a slight accumulation of fluid within the joint, and perhaps both views are correct.

CONCLUSIONS REGARDING ARTHROTOMIES FOR SYNOVITIS.

1. Arthrotomies are generally harmless when done by skillful surgeons. Patients are placed conveniently for efficient control of other steps in treatment when they are in hospitals, and excellent recoveries are the rule in instances of non-purulent synovitis.

2. Early arthrotomies are unnecessary, as well as harmless in non-purulent cases, and great

advantages which are unattainable otherwise do not result from them. Important advantages are not shown convincingly in series of clinical cases, nor do arthrotomies possess marked theoretical superiorities in early cases.

3. Arthrotomies performed during later stages of slowly subsiding chronic knee inflammations of considerable severity possess distinct advantages. They permit examinations of synovial linings for evidences of beginnings of tuberculosis, developing villous enlargements, and other internal knee derangements. They allow removal of fibrinous clots that might lead to serious adhesions, and possibly exert minor accelerating effects towards recoveries of synovial functions from single applications of irrigating fluids.

4. Excessive conservatism in opening knee-joints should be avoided because of the harmlessness of surgery when operations are skillfully done, and because of their positive benefits in selected instances.

5. Conclusions with regard to the illustrative case that has been cited are that it is impossible to decide positively from clinical data alone whether surgery has prolonged or shortened this patient's disability.

The writer's interpretation of the case is that perfect surgery prevented capsular stretching, the joint capsule and periarticular tissue out-distancing the synovial lining in return to a normal state again. At the present time, when capsular and periarticular thickening has disappeared almost to the point of slight atrophy from disuse there is practically perfect motion, but the temporarily slightly impaired function of the synovium which is shown in persisting tenderness and joint weakness, perhaps, would not be of such marked degree now if the synovium had been more perfectly protected continuously by a moderate excess of joint fluid.

If no operation had been performed probably the various reparative processes would have kept pace more evenly with each other. There might be a little more stiffness and soreness of periarticular origin with less noticeable synovial tenderness and joint weakness. With more restricted motion and less noticeable weakness, he might be at work which did not require kneeling. But differences in results of operative and non-operative treatment in cases like this one probably are not large or of very great practical importance.

Before protective synovial fluids are washed

out in early cases, there should be knowledge that they are more toxic than beneficial in nature, but to ascertain such points convenient, new biochemical reactions of joint fluids are needed that are still undiscovered.

Recent advances in knowledge of joint physiology, moreover, tend to emphasize the importance of maintaining local lymph circulation. Perhaps post-operative conditions with complete rest are inferior to slight voluntary shiftings in positions of joint structures from time to time when synovia are protected naturally by joint effusions.

VILLOUS ARTHRITIS.

Villous arthritis is characterized by chronic thickenings of synovia, including synovial villi and fringes that occur normally in knee-joints. Clinically these conditions give evidence of their existence in unusual crepitus when joints are moved as the hypertrophied tissues interfere with each other or get pinched between bearing surfaces.

Causes producing initial thickenings of joint linings include traumata, toxemias and bacterial infections, or combinations of these different factors. From almost imperceptible beginnings, synovial thickenings may increase under continued influence of normal joint use, and through continued mechanical frictions accompanying activity irritate or pull out folds in the lining if the latter get caught between bearing surfaces until, in some instances, pedunculated or free joint bodies are produced.

Well-developed villous arthritis may terminate in a variety of ways.

1. Subsidence and complete restoration of joint functions are most common results after variable numbers of months depending on severity of villous hypertrophies and efficiency of treatments.

2. Continued interference with joint functions for a year or longer from hypertrophied synovia may result, because of repeated new injuries, or continuance of toxemias or infections, or neglect of treatment, or from combinations of these causes.

3. Under these circumstances joint effusions increase and subside alternately, depending on fluctuating amounts of irritation. Capsules weaken and stretch or thicken if they become chronically inflamed by infiltrations of microorganisms. Such states are compatible with very considerable activity for years, neverthe-

less, and a few patients manage to endure chronically weakened enlarged knee-joints without ceasing their usual occupations and without proper medical care.

4. Tubercular disease may develop in thickened synovial linings. Presumably such infections can occur at any period in the course of knee inflammations, or they may be initial causes of synovitis in some instances. All that can be stated positively is that some hypertrophied synovial tissues are found to be tubercular on surgical exploration, and some are not tubercular.

5. Pedunculated villi or detached loose bodies may be formed gradually that eventually slip into comparatively non-obstructing positions from which they emerge at irregular intervals to produce intermittent acute symptoms, or not infrequently they become adherent in non-obstructing positions and more permanent relief than is obtained.

6. Operations are performed with benefit in many instances and at all stages of villous hypertrophy. The topic of surgical treatment overlaps to considerable extent the one concerning operations for synovitis previously mentioned.

OPERATIONS FOR VILLOUS ARTHRITIS.

Conveniences and activities of patients are involved rather than matters of life and death, and accordingly there are widely differing reasons in different cases for or against operative interference. Patients' occupations and positions in life, as well as severity and chronicity of symptoms, hold important place in determining what shall be done. Each problem should become an individual one in which the patients' wishes as well as the strictly medical viewpoints are taken into consideration in arriving at decisions as to most appropriate methods of treatment.

When operations are performed the following clinical results are possible:

1. Removals of pedunculated villi or loose bodies which have been causing marked symptoms are followed by marked relief immediately when wounds have healed and walking has been resumed.

2. Too much synovial tissue is removed at times apparently, especially in less severe types and from supracondylar pads of fat. Patients then complain of sensations of weakness persisting for long periods subsequently, and they have

some difficulties in stepping up to or down from different levels.

3. Extremely gradual changes for better or worse take place after operations many times that should not be interpreted generally as results of surgical interference. The changes would have taken place, presumably, whether or not surgical treatment had been received in the majority of instances. Usually such very slow post-operative changes take place in middle-aged persons whose joints also show definite osteo-arthritic bony changes that have been developing for years.

Simple arthrotomies with careful removals of small bits of synovial tissues probably represent minor incidents in the progress of joints toward steady deterioration under continued faulty vascular conditions in these middle-aged patients. At times operations under these circumstances appear to produce a little improvement for awhile, and on the other hand the unavoidable trauma that attends surgical interference is sufficient to accelerate downward tendencies not infrequently. In all such instances the position of main importance is held by osteo-arthritic disease rather than villous accompaniments.

4. Practical experience proves that arthrotomy with excision of thickened synovial tissue from vigorous young adults at least does not do very much harm when operative technique is executed skilfully, and perfect recoveries of joint functions very often are met with after conservative surgical treatments.

Surgical management provides excellent control of patients, and enables some to recover more quickly because they could not be persuaded otherwise to remain quiet for sufficiently long periods to permit their chronically inflamed knees to recover.

Many arthrotomies that are done for villous arthritis probably are unnecessary as well as harmless especially in the earlier stages.

OTHER KNEE INFECTIONS.

Loosened or detached semilunar cartilages, torn crucial ligaments, fractures of patellae, tibiae and femora, tuberculosis, and neoplasms, all necessitate opening of knees at times; but only a few points relating to some of these topics can be mentioned in this brief paper.

Loose semilunar cartilages may act like pedunculated villi and interfere with joint motions. When there are recurring attacks of

acute symptoms removals of cartilage fragments are followed promptly by decided relief. Occasionally partly loosened cartilages fall back into normal positions apparently and become re-attached without operations if new injuries are avoided, similarly as pedunculated villi slip into non-obstructing places and occasionally become adherent.

There is little harm in waiting during early stages in many instances of cartilage dislocation in spite of occasional abrupt interference with normal motions. When there is a serious inconvenience experienced, then cartilages should be operated on but unnecessary surgery can be avoided safely by conservative methods. As with cases of villous arthritis, each patient should be treated according to individual medical and non-medical peculiarities of the situation.

Complete ruptures of crucial ligaments are serious complications of knee-joint injuries that cannot be discussed, nor can precise indications be given for opening knees after fractures. There may be marked synovial irritations following fractures which make surgical interference advisable because of chronic thickenings, while in other instances slightly crushed tibial heads or femoral condyles repair and readjust themselves best without operations.

Tuberculosis of knee joints of adults should be treated by joint excisions as soon as synovial tissue has been proved definitely to be tubercular by microscopic examination. When tubercular knees of adults are made stiff, the general health usually improves and they are able to resume active lives. When excisions are not made, then tubercular knees continue to cause intermittent or constant trouble, knee functions gradually diminishing, and in a few neglected instances final spontaneous ankylosis following long disability accomplishes by natural means what is quickly done by surgical excisions.

Non-tubercular joint adhesions in septic cases produce complete ankylosis, or more or less limitations in ranges of joint movements, and with or without accompanying pain. There have been devised operations to restore motion in completely ankylosed joints by means of animal membranes and fascia after adhesions have been loosened. On the other hand, painful knees with greatly restricted motions sometimes are made fixed and painless by operations as tubercular knees are treated, or there may be attempts at increasing the range of motions

by distending joint capsules with olive oil or other fluids. Obviously each case must be treated individually on its particular merits with reference to anatomic range of motion and physiological degrees of pain and weakness represented.

WHEN NOT TO OPEN KNEE-JOINTS.

No attempts at knee-joint surgery should be made unless proper facilities for strict surgical asepsis are at hand because serious impairments of joint functions do occur occasionally as results of operations, and many questionable minor advantages gained through early opening of many clean joints are overbalanced if serious harm is done in a few other instances.

Post-operative infections develop occasionally when surgical asepsis has been perfect. This is possibly by blood infections. If weakened joint tissues have their resistance lowered still further by long and clumsily executed operations with much handling of tissues and with attempts at local sterilizations by means of very strong local applications, then circulating micro-organisms sometimes gain foothold if surgical abuse exceeds certain limits although surgical asepsis has been maintained scrupulously.

A young man seen recently by the writer had been troubled to a moderate degree with a joint-mouse that could be felt at times very plainly beneath the joint capsule. He had submitted to an operation which was done under strict surgical precautions under local anaesthesia. The joint body was found to have deep inaccessible attachments that could not be cut for some reason, and after protracted trial the knee was closed with the joint-mouse still *in situ*. After several months of incapacity from a swollen painful knee, there was good return of function, but he refuses further treatment of surgical nature now.

Many middle-aged patients with chronic hypertrophic arthritis should not be submitted to arthrotomies except for unusual reasons, because pathological processes are liable to be accelerated rather than retarded by operations frequently. Degenerative changes taking place in Charcot knees also seem to be accelerated frequently by surgical interference. Hemophilic joints should not be opened, and there are a host of borderline cases of various sorts about which there will be controversies always as to most appropriate methods of treatment. All that can be said is that each case should receive

careful consideration from point of view of patients' probable future activities as well as from probable harmlessness of surgical measures, therefore moderate conservatism in operating should be advocated for the majority of cases.

It is the writer's belief that most radical and enthusiastic surgeons should be supported in their skillful attempts to extend the scope of surgery when they operate on venturesome patients who are willing to take necessary risks and consequences. Surgery has to depend on them both for its wider extension and its most rapid progress.

On the other hand, doubtful or unnecessary operations should not be performed in fairness on patients who expect conservative treatment without unnecessary hazards.

Extreme conservatism seems as desirable in some instances as extreme surgical enthusiasm, and between these limits somewhere the majority of cases should be grouped for greatest satisfaction to patients and for continued welfare of the medical profession.

THE ENERGY REQUIREMENTS OF GIRLS FROM 12 TO 17 YEARS OF AGE.

BY FRANCIS G. BENEDICT AND MARY F. HENDRY, BOSTON.

[From the Nutrition Laboratory of the Carnegie Institution of Washington, Boston, Massachusetts.]

(Continued from page 286.)

INSENSIBLE PERSPIRATION.

By insensible perspiration is meant that loss in weight of the body not attributable to the loss of solid or liquid excreta. It consists for the most part of water vaporized from the lungs and skin, but contains also a relatively small amount of organic carbon and hydrogen oxidized from the body material. Consisting as it does so largely of water vapor, it is subject naturally to such fluctuations as affect the water vapor output. In all probability the main factor affecting insensible perspiration is muscular activity, either minor or major. If this is the case, the insensible perspiration may be looked upon as a more or less crude index of the total metabolism.

In spite of the relative simplicity of the technique for determining the insensible perspiration, we have been able to find in the literature no data for young girls other than those of Camerer.¹⁹ Among his values dealing with

the ages interesting us are those for two girls. One girl, at the age of 12½ years, with a body weight of 32.6 kgs., showed an average loss per kilogram per hour for 24 measurements of 0.74 gram, while at the age of 15 years, with a body weight of 43.3 kgs., she showed an hourly loss of 0.51 gram per kilogram. With another girl at the ages of 13, 14½, and 17 years, with body weights of 30.3, 35.7, and 39.6 kgs., the average hourly loss per kilogram was 0.73, 0.62, and 0.55 gram, respectively.

It was possible for us to measure the insensible perspiration of our girls on six different nights, and our data for these nights are given in Table VIII. The time represented by the measurements was approximately from 10.30 P.M. to 7.15 A.M. As in the pulse table (Table III), those girls who had not reached maturity, *i.e.*, who had not begun to menstruate, are indicated by numbers underlined. An examination of the data in Table VIII for those girls who were present on more than one night is of interest, first, as showing the influence of apprehension caused by the novelty of the observations, resulting in inability to go to sleep immediately or in restless sleep. The data for these girls indicate that there was a slightly higher insensible loss during the first night than during the second or third nights, and consequently one can conclude that our figures are on the whole perhaps a little higher than they normally would be if the girls had been subjected to repeated observations. The several groups of girls appear in Table VIII in the order of decreasing age, while within the groups themselves the data are given according to decreasing body weight. This arrangement of the values enables us to note if there is any influence of age or weight upon the insensible loss. A careful inspection of the table shows that no apparent correlation exists between either age or weight and insensible perspiration per kilogram of body weight.

Laying particular stress upon the loss per kilogram per hour, we see that only in a few instances are values over one gram noted, and it is probably true that these values are affected by some extraneous factor, such as excessive muscular activity. If we make the wholly arbitrary and fairly questionable assumption that these values of one gram and over are abnormal and average the values below one gram, we find that the averages for the several groups are as given in Table IX. Here we