Bruce is a 56-year-old male who presents with persistent mid and low back pain of 12 weeks’ duration. It is generally worse through the day, and is further aggravated by exercise and weight-bearing. Some relief is reported when lying down. He reports that he has lost weight (6 kg) over this time period, and constantly feels tired. He has had two recent bouts of cold and ‘flu type’ symptoms which have been difficult for him to shake. (Case 16.2)

Physical and manipulative therapists often find themselves in the role of the primary contact practitioner, dealing with scenarios such as this. Integral to their role is an ability to identify any underlying medical problems that may require referral to a medical practitioner.

*Cases in Differential Diagnosis for the Physical and Manipulative Therapies* explores scenarios a clinician is likely to encounter, with a view to developing the skills required to confidently arrive at either a final or differential diagnosis. Cases are representative of life stages from infancy to the older years.

**Features**
- over 225 clinical presentations in differential diagnosis
- comprehensive appendices, including orthopaedic tests, complement the diagnostic process
- review of basic and medical science relevant to each case
- model answers to all cases
- over 35 expert contributors from chiropractics, medicine, osteopathy, and nutrition and dietetics
- unique combination of musculoskeletal and non-musculoskeletal clinical cases

*Cases in Differential Diagnosis for the Physical and Manipulative Therapies* will appeal to both students and practitioners of physiotherapy, chiropractic, osteopathy and remedial therapies wishing to develop and refine their diagnostic skills.

**The author**
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CASES IN DIFFERENTIAL DIAGNOSIS FOR THE

Physical and Manipulative Therapies
CASES IN DIFFERENTIAL DIAGNOSIS FOR THE

Physical and Manipulative Therapies

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To the providers of the case studies, who originate from Australia, United Kingdom, United States, France, Norway, and Canada. Thank you for your contributions, and for sharing some of the stories from your patient files. You have helped to illustrate the need for physical and manipulative therapists to develop skills in the diagnosis of more than just musculoskeletal and neurological conditions. Sometimes fact really is stranger than fiction.

To the review panel, whose many helpful suggestions improved the text.

To the staff at Elsevier, who have always been available when needed, enthusiastic and helpful.

To my students — past, present and future — you are the reason that this book was written.

And last, but certainly not least, I thank my family, friends and colleagues who have put up with me while this book was being written.

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How to use this book

Why is this text useful for physical and manipulative therapists?

Physical or manipulative therapists work in a diversity of environments. Some take on the role of a primary care practitioner, while others work from referrals or within a hospital or community setting. Regardless of the setting in which you will eventually work (or are currently employed in), this text should be useful.

For those therapists who do take on the ‘primary contact’ role, skills in identifying any underlying medical problems that may require referral to a medical practitioner are essential. However, it is sometimes challenging for training institutions to provide adequate exposure to all of the possible clinical presentations which may eventually be encountered in practice.

Common presentations to chiropractors, physiotherapists and osteopaths, such as back pain and headache, may actually be due to a serious non-musculoskeletal disease. For example, a situation likely to arise in practice is the need to determine if a patient has uncomplicated mechanical back pain, or a serious visceral pathology causing the patient’s symptoms. Repeated exposure to these types of scenarios, as provided in this text, will help you to develop this skill.

Although a large proportion of your patients will present with a musculoskeletal problem, many will also have other co-existing health problems which need to be addressed. Depression, for example, is a common co-morbid state with chronic pain.

This text will also help you to review the basic and medical sciences relevant to each case, which will help you to better comprehend the significance of many symptoms, signs and investigative findings, and relate them to specific disease states. Understanding is an important element in the development of clinical reasoning.

Patients with musculoskeletal disorders may also present with non-musculoskeletal, or even atypical, symptomatology. When a patient presents to you with chest pain you will usually try to rule out any possible cardiovascular, respiratory or digestive pathologies. However, it may actually be to a thoracic cage or vertebral pathology.

Assumed knowledge

Knowledge of anatomy, physiology, pathology and patient assessment is required prior to attempting the case studies. Concurrent studies should include orthopaedics, neurology, radiology and differential diagnosis.

This text is not intended as a replacement for any core textbooks. Instead, it should be viewed as an aid in facilitating the integration of your developing knowledge and skills within your chosen discipline.
The cases presented in this text will not always be of equal relevance to all readers, due to the unique requirements of your chosen profession. However, all cases represent disorders which every health practitioner should have some knowledge of, regardless of whether they can treat it or not.

Format of text

The introduction to the text describes the art and science of diagnostic decision making. It is important to read this prior to commencing with the case studies.

The cases are presented over four sections: infancy and childhood, adolescence, the adult years and the elderly. Each section comprises a number of chapters, each focusing on a different clinical topic. Each case within the chapter will address, in some way, that topic. In the situation of ‘topics’ which are not typical presenting problems to the physical therapist, then the case will be presented in a way which is as realistic as possible.

The disorders which are addressed through the use of these case studies (either as the final diagnosis or as part of a differential diagnosis) will include a wide selection of musculoskeletal conditions, general medical disorders and mental disturbances. Some of the cases are short and simple, others are longer and more complicated.

The fundamental aim of the text is to facilitate your diagnostic skills. Patient treatment is not discussed within the cases, except in the situation where immediate referral is required to preserve life, or if it forms an integral part of the patient’s history.

There are 4 appendices included. Appendix 1 lists common abbreviations used within the text.

Appendix 2 describes the orthopaedic tests referred to within the cases. It is vitally important to remember that because these tests vary significantly in their degree of sensitivity and specificity, any positive or negative finding must be taken in the context of the rest of the patient history and examination.

Appendix 3 provides a list of important factors that you need to consider when formulating your differential diagnosis.

Appendix 4 provides a list of additional questions that you may wish to consider (either on your own, with your peers or within a classroom setting) regarding the type of treatment appropriate for each of the cases presented.

The cases are presented in Part 1, and the answers are found in Part 2. Please attempt to complete each case prior to checking your answers, as this will facilitate the development of your diagnostic skills.

We hope you enjoy the challenge.
Introduction

Disease is a biological phenomenon; illness is a psychopathological process, while sickness, in addition, incorporates sociocultural connotations. Disease is diagnosed by detecting deviations of structure or function in one or more organ system. Diagnostic decision making seeks to label the disease process, taking into consideration the influence that the patient’s psycho-social environment has on the clinical presentation and management of the condition.

An accurate diagnosis is the foundation upon which appropriate clinical management is based. A competent clinician is a skilled problem solver who has a sound knowledge of disease processes and capably collects comprehensive information about the patient (see Figure 1). A correct diagnosis requires that the clinician have a broad understanding of how various conditions may present in diverse clinical contexts. Good clinicians continuously evaluate the patient’s presentation in the light of the pathogenesis of known disorders.

The problem-solving process

Regardless of the context, the problem-solving process progresses through a number of standard steps. These are:

• problem definition
• problem analysis
• consideration of potential solutions
• analysis and selection of the best possible solution
• implementation of the chosen solution
• evaluation of the outcome.

Clinical problem solving

When applied in a clinical context, the problem-solving process is dominated by two progressive and intertwining themes. The one theme is initially determination of, and subsequently continuing evaluation of, the patient’s clinical presentation. The other theme encompasses both the nosology and pathogenesis of disease. The former refers to the naming and classification of a disorder, the latter to the origin and progression of disease. The problem-solving process is the link which binds these two themes and enables the clinician to make a diagnosis upon which appropriate management can be determined. Exemplary clinical care is characterised by the integration of the dual elements of the problem-solving process in the form of diagnostic and management decision making.

The diagnostic process

Diagnostic decision making is a spiral process. The first spiral is characterised by three identifiable objectives. The first is to clearly describe the characteristics of the presenting condition. The second is to compare this with known disorders and formulate a working diagnosis. The final objective is to gather
additional information that not only confirms the working diagnosis but also provides additional information on possible predisposing factors and provides some insight into the likely outcome of the condition (see Figure 2). The second spiral repeats these three objectives in order to adapt therapy as the clinical condition of the patient changes in response to treatment. Both subjective and objective information are used to adequately comprehend the many dimensions of the presenting complaint and meet the demands of ongoing care.

Data collection is a fundamental process underlying diagnosis. It includes inquiries about the patient’s symptoms, the detection of signs and the use of special investigations to confirm clinical suppositions. Biological changes mark the transformation from health to disease. In the early phases of disease development, such changes are small and can only be detected at a chemical or cellular level. At a later phase, the outcome of disease pathogenesis is overt and associated with symptoms and signs. The definitive diagnosis provides the trigger to selecting appropriate therapy; patient monitoring ensures that treatment is modified as required. The importance of an accurate diagnosis cannot be overemphasised.

The art and science of medicine

Successful diagnosis results from practising both the art and science of medicine. It relies on gathering information from the patient and analysing this in
the light of current scientifically sound thinking regarding health and disease. Diagnostic decision making is dominated by the need to analyse the presenting complaint and compare it to known disorders.

**Data collection**

Comprehensive data collection is essential for arriving at a reasonable diagnosis. The patient’s current problem, their illness history and their lifestyle, both past and present, are all variables worthy of consideration. Data collection is furthermore not limited to the patient’s presenting complaint; the clinician also needs to delve into the medical history of the patient’s parents and siblings to ascertain the family’s propensity for certain conditions. The chances of making a correct diagnosis are directly related to the accuracy with which a patient’s information has been gathered.

Skillful data collection epitomises the art of medicine. Not only does data collection gather information required to make a diagnosis, it also crucially provides an opportunity to establish rapport with the patient. Clinical outcomes are influenced both by the particular treatment regime selected and the milieu in which clinical care is delivered. While the primary overt objective of history taking is formulation of one or more preliminary working diagnoses, establishing good rapport is an important covert objective. The rapport achieved during data collection has a substantial impact on the enthusiasm with which the patient is likely to adhere to the proposed therapeutic regime. Establishing

![Figure 2 The consultation process](image-url)
a good patient–practitioner relationship is a vital component of competent clinical practice.

**Formulating a diagnosis**

The initial objective of the data collection exercise is clarification of the presenting complaint by history taking or ‘symptom collection’. Symptoms encompass the subjective experience of the patient. The presentation of an illness experience is influenced by a diversity of factors ranging from the individual’s genotype to their sociocultural background. While an individual’s genotype may be predetermined, their phenotype or gene expression is influenced by their lifestyle choices. Furthermore, the presentation of any condition is influenced both by the disease process and that individual’s vicarious and personal previous experience of the sick role.

History taking is the initial step in attempting to discern whether the patient’s complaints are consistent with the symptom pattern of a known disease. Non-directive questioning using open questions is most helpful in the early stages. Closed questions are used once the clinician wishes to compare the emerging clinical picture with known disorders. The second phase of data collection is physical examination. Signs are the physical manifestations of the disease process. They provide objective evidence of deviation from health. On physical examination, clues identified during history are actively pursued and physical evidence is sought to confirm conditions suggested by the patient’s history. At this stage the two themes of diagnostic decision making are inseparable. The clinician progresses towards a realistic diagnosis by comparing the patient’s symptoms and signs to various known disorders. Knowledge of diseases present in the local community, of those prevalent given the patient’s age group and gender, as well as in family’s disease history are all relevant considerations. Data collected on physical examination is analysed to refine the list of potential diagnoses and arrive at a single working diagnosis.

**Confirming a diagnosis**

Confirmation of the accuracy of the preferred working diagnosis can usually be achieved either with the help of special investigations or through a therapeutic trial. As special investigations are usually more invasive and expensive than physical examination they are selectively used to convert the preferred working diagnosis into a single definitive diagnosis. Special investigations include laboratory investigations ranging from haematology and blood chemistry to biopsy and histological examination. They include investigations ranging from radiological investigations to ultrasound and magnetic resonance imaging. Ideally special investigations should be reliable, valid, sensitive, specific and have an acceptable predictive value. Reliability refers to the reproducibility and consistency of a test; validity reflects its accuracy. A sensitive test is one which is positive in individuals with the disorder; sensitivity is particularly important when screening for disease and reduces the risk of failing to recognise a disorder. A specific test is one which is negative in individuals who do not have the disorder; specificity is important to reduce the risk of making an incorrect definitive diagnosis and consequently initiating inappropriate and/or unnecessary treatment. The predictive value of a test is influenced not only by its sensitivity and specificity but also by the prevalence of the disease patterns in the local community. In instances in which special investigations are either not
available or are unsatisfactory, a therapeutic trial provides the alternative option. A definitive diagnosis can then be confirmed retrospectively when a patient responds to therapy based upon a working diagnosis.

It would have been noted that as gathered data accumulates, problem definition is increasing, accompanied by data analysis. As the clinical consultation progresses the initial list of working diagnoses is shortened and refined until, finally, either the preferred working diagnosis is subject to a management trial or a definitive diagnosis is recorded.

**Diagnostic strategies**

A comprehensive understanding of the causes, evolution and clinical presentation of a wide range of disorders is a prerequisite to diagnostic decision making. The presenting complaint is analysed and an attempt is made to integrate the data collected so as to achieve a recognisable disease pattern.

**Pattern recognition**

The clinical presentation of a disease is the sum of the biochemical, physiological and anatomical changes that have occurred as a result of the disease process. The natural history of a disease is the description of the changes that occur as the individual moves from a healthy to a diseased state. Pathogenesis is the term used to describe the progression from health to disease. The natural history of disease describes the physiological and pathological changes which occur and serve as markers of disease. It includes identification of the initiating stimulus, causal agent or event; a description of the pathophysiological changes which result and the outcome of the condition in the absence of intervention. Pathophysiological changes may, particularly in the early stages, be reversible. Early diagnosis lends itself to early intervention and enhances the probability that the disease process is nullified.

The earliest suggestion of pathophysiological changes is often a subjective realisation of the individual that ‘something is wrong’. This is the phase of symptom experience. By carefully eliciting all the patient’s symptoms and comparing them with known disease patterns the astute clinician can often list a number of working diagnoses. Once a number of disorders are suspected, knowledge of the pathogenesis of these conditions enables the clinician to actively search for other symptoms and signs that fit the unique pattern of each suspected disorder. The presence, rather than the absence of, particular symptoms and signs provides more convincing information when narrowing the list of possible disorders. The larger the number of diagnostic criteria identified, the greater the likelihood that a disease has been given a correct label. Pattern recognition is an important strategy for making a diagnosis.

**Causal reasoning**

While pattern or syndrome recognition is the key strategy for making a diagnosis, the characteristic disease picture is only established once the disorder has progressed. Pattern recognition does not necessarily lend itself to making an early diagnosis. In instances in which therapy alters the natural history of a condition, the earlier a diagnosis is made the better the outcome. In these instances a working diagnosis may become possible at a stage when the clinical picture is poorly defined by detecting the presence of an acknowledged cause.
Whereas pattern recognition involves identifying and comparing the patient’s presentation with a known disease picture, identifying the cause of a condition is helpful insofar as it identifies the factor(s) or triggers responsible for the condition. By identifying the likely cause of the patient’s complaint a working diagnosis can be postulated before the disease picture is fully developed. Early elimination or neutralisation of the cause of a disorder makes it possible to halt the progression of a disease.

**Probability reckoning**

In addition to using pattern recognition and causal reasoning which rely on an understanding of the pathogenesis of a condition as a basis for making a diagnosis, the probability of an accurate diagnosis is increased when the suspected condition is prevalent in the local community. Epidemiological studies have established disease risk in various population groups and geographical areas. The likelihood of being exposed to various conditions is influenced by inheritance and behaviours, both those dictated by culture and lifestyle choices. When combined with pattern recognition, probability analysis takes cognisance of the relative possibility of a particular disease given the patient’s presentation.

**Diagnosis: in perspective**

A correct diagnosis is a prerequisite to outstanding clinical care. An accurate diagnosis is most likely when diagnosis is based upon a number of signs and symptoms, tests with high sensitivity and specificity are used and the patient’s disorder closely matches the identifying pattern of signs and symptoms of a known disease.

An accurate diagnosis results in appropriate therapy, decreasing the risk of complications and hastening a return to wellness. An incorrect diagnosis implies a missed diagnosis and delays intervention. While inappropriate intervention is pursued, unrecognised disease may progress. The likelihood of irreversible pathology increases with disease progression. As therapy is based upon the diagnosis, incorrect labelling of a condition may furthermore lead to inappropriate therapy. Therapy can be associated with side effects. While the benefits of appropriate therapy outweigh the inconvenience of side effects, the adverse effects of incorrect therapy have a cost–benefit ratio which approximates infinity.

**Reference**

Chapter 5

Pain in infancy and childhood

CASE 5.1

Astrid is a 9-week-old infant presenting with intermittent, inconsolable crying. She has regular episodes of high-pitched crying, occurring daily in the late afternoon. The crying is accompanied by the drawing up of the lower limbs. These episodes have occurred nearly daily for the last 4 weeks.

Her mother had consulted a medical practitioner and is aware that this is common and that Astrid will ‘grow out’ of the problem. She is, however, desperately tired and requests assistance.

Physical examination reveals no abnormalities.

Questions

1. What is the most likely diagnosis, based only on the history? Give reasons for your answer.
2. Why was it important for Astrid to be assessed by a medical practitioner?
3. Why is this presentation unlikely to be intussusception?
4. What are some of the proposed mechanisms for the development of this disorder?

CASE 5.2

Josef is a 9-year-old boy who presents with multiple episodes of abdominal pain over the last 6–8 months. When it occurs, he describes it as relatively constant, not overly ‘intense’ and lasts up to a few hours. It is difficult to pinpoint, although he admits that it is more central than peripheral. He has had no change in bowel habits, does not feel nauseated and has not vomited. These episodes tend to occur in the mornings, and get better later in the day. Episodes occur once every 2–3 weeks. He is otherwise a healthy child. Josef and his mother consulted a medical practitioner for this problem, who did not see the need to conduct any investigations. Physical examination is normal.

Questions

1. Why do you think that the medical practitioner did not see a need to conduct investigations?
2. What is your differential diagnosis?
3. Do you believe that investigations should have been done?
4. You refer Josef to another doctor, who performs a number of tests. Which investigations do you think may have been done?
5. All tests are normal. What is the most likely diagnosis?
6. Briefly describe some of the theories regarding the cause of this problem.
7. What age groups does this condition often affect?

CASE 5.3

Robbie, a 5-year-old boy, has bilateral lower limb pain. It is described as diffuse pain, present only late in the day or at night-time. There are no noticeable
physical deformities, no swelling, redness, or rashes. The pain has been episodic in nature and started approximately 2 months ago. Robbie’s mother has been giving Robbie leg massages, which appears to help relieve the pain.

Questions
1. What are the possible causes of his pain?
2. What pertinent questions do you wish to ask?
3. Assume that further history taking reveals no additional relevant data, and that physical examination is normal. From this information, what is the most likely diagnosis?

CASE 5.4

History
Isha is a 9-year-old girl who presented at her local GP clinic with pain in the right hypochondrium. The pain was mild in intensity with episodes of mild pain lasting for 15–20 minutes or so and then subsiding by itself. The patient experiences approximately 1–2 episodes in a week, starting 2–3 months ago. However, it was not associated with any other symptom and did not hinder any of her activities. Nothing abnormal was found during abdominal examination and it was thought to be non-specific abdominal pain (quite common in school aged children). The doctor prescribed simethicone for symptomatic relief.

Isha presented again after 4 months, and this time the pain would come and go more frequently than before. The medicine prescribed earlier had no effect on the pain. The pain would go away by itself in 20–30 minutes. The patient denied any association with food intake. It was not colicky in nature. Further history revealed the patient also experienced frequent belching and mild nausea without any actual episode of vomiting associated with it, for almost the same duration. Systemic review revealed a moderate degree of allergic rhinitis.

When inquired about the past medical history, Isha’s mother informed the doctor that the child was a diagnosed case of hereditary spherocytosis — a type of haemolytic anaemia — and had been admitted to hospital 1 year ago for the treatment of severe anaemia. At that time she suffered a viral infection (Erythema infectiosum) that triggered severe haemolysis and an aplastic crisis. She was admitted to the hospital with a haemoglobin of 50.0 g/dl (Ref. range 115–150 g/l). Her bilirubin levels rose to 56 μmol/l (Ref range: <12 μmol/l). Urgent bone marrow biopsy revealed a good functioning bone marrow. She was treated with 2 packs of red cells. She was kept under observation for 3 days. Her haemoglobin increased to 90.0 g/dl post transfusion, when she was discharged.

The rest of the history was unremarkable.

Questions
1. Using only this information, list the possible causes of Isha’s presenting symptom(s). Justify your answer.
2. Why was Isha asked about the association of her pain with food? What type of food in particular would have an association with right hypochondrial pain?
3. What is the significance of the colicky nature of pain?
4. How can a bone marrow biopsy help in differentiating the cause of anaemia?
5. Is there any possible relationship between her past history and present complaint?
6. What do you need to examine in this patient?

Physical examination

<table>
<thead>
<tr>
<th>General</th>
<th>Isha was found to be a relaxed and cooperative child and not complaining of any abdominal pain. Skin was not yellow, although there was mild icterus in sclerae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitals</td>
<td></td>
</tr>
<tr>
<td>• Pulse rate/min</td>
<td>90</td>
</tr>
<tr>
<td>• Respiratory rate/min</td>
<td>16</td>
</tr>
<tr>
<td>• Blood pressure mm Hg</td>
<td>90/60</td>
</tr>
<tr>
<td>• Height (cm)</td>
<td>130</td>
</tr>
<tr>
<td>• Weight (kg)</td>
<td>35</td>
</tr>
<tr>
<td>• BMI</td>
<td>20.7</td>
</tr>
<tr>
<td>• Temperature (degrees C)</td>
<td>36.6</td>
</tr>
<tr>
<td>HEENT</td>
<td>Mild icterus in sclerae. Conjunctivae were both normal with no sign of anaemia</td>
</tr>
<tr>
<td>Neck</td>
<td>No lymphadenopathy</td>
</tr>
<tr>
<td>Chest</td>
<td>Unremarkable</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Examination revealed a soft abdomen with no guarding. None of the viscera were palpable. Given her history of haemolytic anaemia the GP specifically looked for splenomegaly, but neither the spleen nor the liver were palpable. The patient complained of slight tenderness while the liver was being examined</td>
</tr>
<tr>
<td>Neurological</td>
<td>Unremarkable</td>
</tr>
</tbody>
</table>

Questions

7. What information can you obtain from these findings? Can you narrow your differential diagnosis?
8. Explain the significance of the mild icterus in the sclerae.
9. How would your differential diagnosis vary if:
   a. the patient complained of tenderness in the epigastric region instead
   b. if Murphy’s sign had been positive?
10. What is the significance of splenomegaly in cases with haemolytic anemias?
11. What investigations are required following her referral to a medical practitioner? Why?

Investigations

Blood studies

At this stage, the medical practitioner decided to repeat a full blood count (FBC), liver function tests (LFT) and get an abdominal ultrasound to see the status of the liver, gallbladder and spleen. The blood test results came back consistent with spherocytosis with moderate anisocytosis and spherocytosis in red cell morphology, although the haemoglobin level was within the normal range. White cell count, platelets and most liver function tests were also normal. However, serum bilirubin came back as 47 \( \mu \text{mol/L} \) (average range: 3–15 \( \mu \text{mol/L} \)).
Abdominal ultrasound

Report: Images of the pancreas are unremarkable. The size, contour and echogenicity of the liver are normal. There are small mobile gallstones in the gallbladder without evidence of cholecystitis. No intrahepatic duct dilation is seen. The portal vein is patent. There is no ascites. The spleen measures 10.9 cm in length, at the upper limit of normal. The right kidney measures 9.7 cm in length and the left 9.6 cm (within normal range). No focal renal lesion or hydronephrosis.

Conclusion: There are multiple small gallstones.

Follow-up: Since the abdominal ultrasound report came back positive for small, mobile stones present in the gallbladder, the medical practitioner referred the case to a paediatric surgeon who requested a Tc–99 DISIDA Hepato-biliary scan.

DSIDA Hepatobiliary Scan

The patient underwent a fasting scan and then was advised to have a lunch consisting of fried and fatty food. Thirty minutes after lunch comprising of pizza and french fries, the scan was repeated.

Report: Radiopharmaceutical: Tc-99 m DSIDA.

Initial hepatobiliary dynamic imaging shows adequate tracer perfusion and extraction by liver. The hepatic duct started to be visualised by 13 minutes with eventual filling in of the gallbladder by 19 minutes. Succeeding images showed the eventual tracer egress into the lower intestinal tract by 40 minutes. Delayed post-meal images showed minimal contraction of the gallbladder with significant tracer retention within and eventual tracer washout from the liver into the lower intestinal segment.

Hepatic extraction fraction: 100% (NR >92%).

Gallbladder ejection fraction: 37% (NR >35).

Impression: Good hepatic function with low normal gallbladder ejection fraction. No sign of intra hepatic cholestasis noted.

Follow-up: Since the scan reported low normal filling and emptying of gallbladder, the surgeon decided to operate. Laparoscopic cholecystectomy was performed and an intact gallbladder removed and sent for pathological examination.

Biopsy of gallbladder

Macroscopic description: Specimen labelled gallbladder consists of previously unopened gallbladder 60 mm in length and 25 × 23 mm across. The serosal surface is green grey and glistening. The wall is 1 mm in thickness and the lumen contains bile and pigmented gallstones 15 × 7 × 4 mm, with stones 2–5 mm in maximal dimensions. The mucosa is green and velvety.

Microscopy and diagnosis: Sections of the gallbladder show patchy chronic inflammation within the lamina propria. The mucosa is partially stripped, but otherwise unremarkable, with minimal thickening of wall.

Summary: Gallbladder with mild chronic cholecystitis and cholelithiasis.

The patient recovered well from the surgery and was allowed to go home 3 days later with a follow-up appointment due 1 week later. At this time she was pain-free with good healing in all laparoscopic ports. The patient experienced slight indigestion that also resolved in the next few weeks.
Questions
12. a. What is a DISIDA scan?
   b. What information in the microscopic section of gallbladder signifies presence of inflammation in the gallbladder?
   c. Why did the surgeon decide to operate even though the pathology result came back as mild chronic cholecystitis?
13. a. Is there a need for further follow up with this patient?
   b. What dietary advice should be given to Isha’s parents?
14. Describe the pathophysiological mechanism associated with formation of gallstones after severe haemolysis of red cells.
15. What are the different types of gallstones?

CASE 5.5
A healthy 10-year-old boy attended summer camp in June, 1991. During his week-long visit to the camp, he developed an acute illness with nausea, vomiting and a high fever. The camp nurse diagnosed ‘a virus’, for which he received no treatment and appeared to have recovered after about 3 days. This was followed by about 2–3 weeks of swelling of his hands, feet, and ankles. His parents were somewhat concerned about this, but did not immediately seek medical attention.

Questions
1. Are you satisfied with the nurse’s impression of ‘a virus’? Explain your answer.
2. What is the significance of the swelling that this child experienced?
During the remainder of 1991, the child complained of morning stiffness and lowered energy and, eventually, the child’s paediatrician was consulted. He diagnosed ‘growing pains’ and reassured both mother and child. The mother remained concerned and recalled that her son ‘felt different’ when she hugged him. By December 1991, the child began to complain of right ‘hip’ pain (in the inguinal region). Again, the physician was consulted, this time diagnosing ‘bursitis’.
3. What are ‘growing pains’? Is this a legitimate diagnosis?
Just prior to the child complaining of inguinal pain, in December 1991, the child’s mother brought him to a chiropractor for investigation of the ongoing concerns about joint stiffness and pains (and fatigue). The chiropractor determined that the child was complaining of multiple joint pains as well as lower back pain. The lower back pain appeared mechanical in origin and responded positively to manipulation therapy. However, the chiropractor was concerned about the other complaints and felt a consultation was necessary.
4. What do you suppose concerned the chiropractor, and to what type of specialist was the patient referred?

Also, at the time of this initial consultation, additional history was obtained. At age 5 (i.e. 5 years previously), the child had been injured after being struck by an automobile, while being watched by his grandmother. He fractured his mandible and left clavicle, and suffered a closed head injury (with unconsciousness
lasting several days). His mother felt that he ‘was never quite right after this’ (but she could not be more specific). The child also used a bronchodilator puffer from time to time for mild asthma.

5. Is there any significance to the mother’s somewhat vague observation?

A month later, in January 1992, the child presented to the chiropractor with a slight fever and extreme pain in the right hip. The chiropractor, by now, had treated the child on several occasions and was able to ascertain that the child could accurately portray his symptoms. He was quite literally in agony when seen in this acute state. The child was immediately taken to the hospital in acute distress as a result of the severe pain. At the hospital, the child was examined by the orthopaedic surgeon. During the examination, specifically the Patrick FABERE test, the child was in so much pain that he was practically inconsolable. The presumptive diagnosis was septic arthritis and he was treated by open drainage and intravenous antibiotics. The cultures were negative for infection and the child gradually improved over a 3-week period.

6. What are the key indicators of septic arthritis?

The child’s mother continued to seek help from her chiropractor and, during the early spring of 1992, the child was again seen complaining of left knee pain, left ankle pain, right elbow pain and pain in both wrists. All these pains were variable from mild to very acute and there was no obvious redness, swelling or joint heat with the exception of the left knee which had some swelling posteriorly similar to that of a Baker’s cyst.

7. As the child’s physical therapist, what might you be considering?

During this examination, the chiropractor’s findings were as follows:

- Left knee — slight posterior puffiness;
- left ankle — acutely tender to touch and to all movements, no swelling, no heat, no rash, no open wounds;
- right elbow — all movements painful;
- right wrist — supination and pronation painful, flexion and extension not painful.

Additional history was provided during the examination — the mother noted an increasing tendency of her son being unable to get out of bed without assistance.

8. What is the general significance of these physical signs?

In May 1992, the child finally was able to see the rheumatologist. At the time of that consultation he complained of swelling and pain of both shoulders, both elbows, both hands, the right knee and both ankles. Additionally, he complained of morning stiffness, reduced energy and recent weight gain. His rheumatology exam findings included: BP 100/80; HR 80; RR 20; height 151 cm; weight 64 kg; tenderness over both temporomandibular joints; tenderness over the left biceps proximal tendon; 14 of 18 fibromyalgia points were tender to palpation.

9. What is the significance of the 14/18 tender points and how should these points best be tested?

From the time of the initial consultation until the child was 12, the chiropractor had tracked the child’s height and weight as depicted in Figures 5.1 and 5.2 (note, at this point in the case study, the child is 11).
10. What might have caused the weight gain?

Following the consultation with the paediatric rheumatologist, the specialist’s conclusions (communicated to the chiropractor in a referral letter) were: ‘reactive arthritis’, requiring ‘no further treatment’, and fibromyalgia, for which the recommended treatment was that the child ‘just needs a good night’s sleep’, liberal use of a heating pad and stretching exercises (requiring the patient to attend physical therapy session several times per week, about 90 minutes from home each way).

11. While the child’s parents felt satisfied that the specialist had provided an appropriate opinion, the chiropractor was suspicious that the condition had not been properly investigated. Why?

An observation by the mother of what seemed like unusually dark urine prompted another return to the rheumatology clinic. The urine was checked, and the haematuria was confirmed. The child was immediately admitted to the hospital for investigation.
12. What is the significance of these new findings?

After several weeks in hospital, in August 1993, the child was finally diagnosed.

13. What is the most likely diagnosis? What are the cardinal features of this disorder?

The subsequent treatment, following the confirmation of the diagnosis, was high dosage prednisone (including pulses of over 1000 mg at a time) and methotrexate. Within a few months the child developed signs of renal failure, severe nosebleeds and progressive respiratory distress.

14. What is causing the child’s oedematous appearance?

The disease continued to progress and finally the child was placed on a respirator, with advice to the parents that his death was imminent. To the surprise of the medical staff and family, he managed to stabilise and recover slightly from this very serious condition. Within a few weeks, he was fortunate to have been invited to participate in a clinical trial at the National Institute of Health (NIH), to which he and his mother travelled monthly, by air, for several years. The NIH rheumatologists felt that the 3-week course of antibiotics in 1992 was the ‘worst thing that could have been done’, and they questioned the large doses of pulsed prednisone. While a patient at NIH, his treatment consisted of various combinations of methotrexate, cyclophosphamide, azathioprine (Imuran), etanercept (Enbril) and prednisone.

15. What kinds of conditions are these medications commonly used to treat?

A pharmacologic odyssey — the record of medications used by this patient includes the following: prednisone/methotrexate; following a relapse, prednisone/cyclophosphamide, intravenously; following another relapse, prednisone/methotrexate, followed by prednisone/etanercept (Enbril), in the NIH study; following a relapse, prednisone/cyclophosphamide, orally; finally, prednisone/azathioprine (Imuran) for the past 4 years, starting at 100 mg per day (azathioprine) and now at 50 mg per day.

His current medications (as at the time of publication of this book) are: azathioprine (50 mg per day); prednisone (15 mg every other day); amlodipine besylate (Norvasc, 5 mg per day); alfacalcidol (0.25 mcg per day) and irbesatran (Avapro, 300 mg per day).

16. His current medications include drugs to assist with blood pressure regulation and calcium metabolism. Why?

17. Speculate on when this disorder actually might have begun in this patient (as distinct from when it was formally diagnosed).

The patient continues to do well in remission and is currently working full-time, with periods of part-time employment related to recurrent fatigue, while he awaits a kidney transplant.

**CASE 5.6**

**History**

Lawrence is an 11-year-old boy who presents with a chronic complaint of migraine. His mother states that he has had the migraines for over 2 years, but
cannot recall any event that seems to trigger them. He describes the migraine as severe, usually throbbing, and focused around his eyes. His mother has noted that he is often ‘sick’ when he gets a headache.

Lawrence’s mother says she doesn’t experience migraines herself, and doesn’t think anyone else in the family suffers them. Lawrence is also an asthmatic, but still manages to play cricket and rugby on a regular basis. He is otherwise well, and has no significant past illnesses.

Although his headaches have been diagnosed as migraines by his medical practitioner, Lawrence and his mother are consulting you to explore the possibility of using physical therapies to help reduce his symptoms.

**Questions**

1. What is the typical description of:
   a. common migraine
   b. classic migraine?
2. List the intracranial and extracranial causes of headache.
3. What are the key headache types and their most common features?

**Physical examination**

<table>
<thead>
<tr>
<th>General</th>
<th>Lawrence is a short, thin boy, slightly pale appearance, with darker circles around his eyes. Lawrence is happy and answers questions well</th>
</tr>
</thead>
</table>
| Vitals  | • Pulse rate/min 72
• Respiratory rate/min 20
• Blood pressure mm Hg 120/80
• Height (cm) 130
• Weight (kg) 32
• BMI 18.9
• Temperature (degrees C) 36.6 |
| HEENT   | Unremarkable |
| Neck    | Unremarkable |
| Back    | Unremarkable |
| Chest   | Unremarkable |
| Abdomen | Unremarkable |
| Neurological | Unremarkable |

**Questions**

4. Do these physical examination findings suggest a cause of his headaches other than migraine?
5. What methods could Lawrence (and his mother) use to help establish a pattern to his headache, and understand if any future treatments are working?
6. What specific questions or other testing would help you assess a child with a headache?
7. What is your final diagnosis, based on these results? Justify your answer.
8. Are headaches a common complaint in the paediatric population?
PART 2

Answers to cases studies
Chapter 5

Pain in infancy and childhood

**CASE 5.1**

1. **What is the most likely diagnosis, based only on the history? Give reasons.**

   Infantile colic. The episodic nature of the crying, with normal intervals between them, suggests that the problem is not due to an acute pathological state. The timing of the episodes, in an infant of this age, is most likely infantile colic.

2. **Why was it important for Astrid to be assessed by a medical practitioner?**

   To rule out any serious medical or surgical condition.

3. **Why is this presentation unlikely to be intussusception?**

   Intussusception is an acute condition, not a recurrent condition. As it causes a mechanical bowel obstruction, it rarely resolves without any intervention. In addition, the age group predominantly affected by intussusception is 3–12 months, whereas infantile colic generally resolves at approximately 3 months of age.
4. What are some of the proposed mechanisms for the development of this disorder?

There have been many theories regarding the mechanism for infantile colic. These include parental stress, maternal smoking during pregnancy, neurological alterations, psychological or behavioural disturbances and altered digestion (including allergies, microflora changes, feeding habits etc).

CASE 5.2

1. Why do you think that the medical practitioner did not see a need to conduct investigations?

He/she must have been convinced that there is no major pathology. The rationale for this is likely to be based on the following aspects of Josef’s history:

- only 1 episode every 2–3 weeks
- has been occurring for 8 months, but not getting worse
- episodes do not last more than a few hours
- no changes in bowel habits, nausea, vomiting or weight loss
- centrally located pain, rather than peripheral (the further the pain is located from the umbilicus, the more likely it is a pathological problem).

2. What is your differential diagnosis?

- ‘Pain disorder’ as a manifestation of a somatoform disorder.
- Irritable bowel syndrome.
- Food allergy/sensitivity.

3. Do you believe that investigations should have been done?

Other causes of abdominal pain should be excluded prior to making a diagnosis of either ‘pain disorder’ or irritable bowel syndrome. These diagnoses are best made after elimination of all other causes.

4. You refer Josef to another doctor, who performs a number of tests. Which investigations do you think may have been done?

Investigations may have included:

- stool examination — microscopy and culture
- full blood count and erythrocyte sedimentation rate (ESR)
- C-reactive protein
- iron studies
- IgA levels
- anti-gliadin antibodies
- t-transglutaminase and endomysial antibodies
- urine culture
- possibly endoscopy or abdominal ultrasound if indicated.

5. All tests are normal. What is the most likely diagnosis?

The most likely diagnosis is ‘pain disorder’ as a manifestation of a somatoform disorder.

6. Briefly describe some of the theories regarding the cause of this problem.

Problems in the first few months of life may — in some individuals — sensitise the gastrointestinal tract to pain in later years.
Theories which attempt to explain somatoform disorders can be used to explain recurrent abdominal pain in children. These span a broad range of causes, including stress, trauma, abuse, emotions, social factors, biological factors, communication difficulties, learned behaviour, psychodynamic and ‘family systems’ theories.[2]

7. What age groups does this condition often affect?
It may affect children from pre-school age to adolescence.

**CASE 5.3**

1. What are the possible causes of his pain?

<table>
<thead>
<tr>
<th>Possible cause</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overuse syndromes (eg: stress fracture, Osgood-Schlatter disease, shin splints, Severe’s disease, condromalacia patellae)</td>
<td>Common in children who play sport</td>
</tr>
<tr>
<td>Rheumatoid conditions</td>
<td>Begin to appear at this age (4–10-year-olds)</td>
</tr>
<tr>
<td>Growing pains</td>
<td>Age of patient, pain at night, diffuse bilateral leg pain. It is a diagnosis of exclusion</td>
</tr>
<tr>
<td>Legg-Calve-Perthes disease</td>
<td>This commonly affects children between the ages of 4–8 years old and is five times more common in males than females[3]</td>
</tr>
<tr>
<td>Fractures, dislocations and ligamentous injuries</td>
<td>Trauma is the most common cause of acute limp in children,[3] In young children fractures are more common than sprains and strains,[3] Need to consider child abuse if the injury does not match the given history</td>
</tr>
<tr>
<td>Infections</td>
<td>At this age osteomyelitis commonly starts from the terminal vessels in the metaphysis of growing bones. Clinical signs include fever and systemic signs plus tenderness, redness, warmth and swelling. However, this condition is often monoarticular most commonly affecting the hip</td>
</tr>
<tr>
<td>Duchenne muscular dystrophy</td>
<td>Most common muscular dystrophy affecting 1 in 3500 males born worldwide. This clinically manifests in patients aged 3–7 years old. Clinical signs include increased lordosis, presence of Gowers sign and waddling/wide-stance gait[4]</td>
</tr>
<tr>
<td>Neoplastic lesions: leukaemia and Ewing sarcoma</td>
<td>This diagnosis would be more unlikely, but should be a consideration in a child with lower limb pain. Possible benign bone tumours at this age include osteoid osteoma and osteochondroma, and malignant bone tumour considerations are osteosarcoma and Ewing sarcoma. Leukaemia and metastatic neuroblastoma are systemic neoplastic diseases which may cause leg pain[5]</td>
</tr>
</tbody>
</table>
2. What pertinent questions do you wish to ask?

- Where is the exact location of the pain?
- Is the pain getting progressively worse? (May indicate something more sinister like neoplasm, Duchenne muscular dystrophy.)
- Does Robbie have a limp? (Red flag in children! May indicate trauma, Legg-Calve-Perthes disease, slipped capital femoral epiphysis, neoplasm, etc).
- Does Robbie have a fever, chills or other constitutional symptoms? (May indicate infection, septic arthritis, malignancies, juvenile idiopathic arthritis.)
- Is there a history of trauma?
- Is Robbie able to play and keep up with other children? (If unable to keep up with other children his age, this may indicate a congenital or developmental disorder; eg: Duchene’s muscular dystrophy.)
- Is the pain aggravated by exercise? (This is an indicator for Legg-Calve-Perthes disease.)
- When during the day is the pain present? (Growing pains are only present at night. Early morning stiffness may be an indication of juvenile idiopathic arthritis. Nocturnal pain may suggest bone neoplasms, osteoid osteoma or growing pains.)
- Does this pain wake him up at night? (Red flag.)
- Are there any cuts, bruises or swelling present? (Presence of trauma, child abuse.)
- Does Robbie participate in competitive sports activities? (Possibility of overuse syndromes/stress fractures.)
- Is there any weakness in the legs? (May indicate neurological disorder or Duchenne muscular dystrophy.)
- Is Robbie’s gait affected? (Waddling or wide-based gait may indicate Duchenne muscular dystrophy; spastic gait may indicate upper motor neuron lesions.)
- Does Robbie have trouble standing from the seated position? (Presence of Gowers’ sign; sign of Duchenne muscular dystrophy.)
- Does Robbie bruise easily, or has he had any recent weight loss or bone pain? (May indicate neoplastic disease.)
- Is there any family history of muscular dystrophy (Duchenne or Becker), vitamin D resistant rickets, systemic lupus erythematosus or rheumatoid arthritis?

3. Assume that further history taking reveals no additional relevant data, and that physical examination is normal. From this information, what is the most likely diagnosis?

The clinical picture is typical of ‘Growing pains’ — however this is a diagnosis of exclusion.

‘Growing pains’ is a benign condition, with the patient typically having symptoms occurring only at night, symptoms are not present upon awakening in the morning, and no limp or fever.

However, referral to a medical practitioner is required to instigate investigations to eliminate serious pathology.
1. Using only this information, list the possible causes of Isha’s presenting symptom(s). Justify your answer.

All the structures present in the right hypochondrium should be considered as a possible source of the pain, ranging from acute hepatitis from various viral causes, acute or acute on chronic cholecystitis, cholelithiasis, or non-specific abdominal pain.

Non-abdominal conditions such as muscular spasm, herpes zoster (pre vesicular phase), lower rib cage trauma and lower rib fracture should also be considered.

2. Why was Isha asked about the association of her pain with food? What type of food in particular would have an association with right hypochondrial pain?

Conditions such as cholecystitis would be affected by the consumption of fatty food. If there is inflammation present in the gallbladder, pain would be triggered when the gallbladder contracts in order to release bile into the intestine.

3. What is the significance of the colicky nature of pain?

Colicky pain is classically associated with excessive contraction of muscle in the wall of a hollow organ or duct.

4. How can a bone marrow biopsy help in differentiating the cause of anaemia?

A bone marrow biopsy helps to assess the activity of marrow. In a case of aplastic anaemia, where the problem lies in the red blood cell (RBC) manufacturing at the marrow level, the bone marrow is hypocellular. However, in the situation where the bone marrow is healthy, (and the cause of anaemia is not related to bone marrow pathology), it may appear hypercellular, as it is trying to replace and/or compensate for the lack of RBC in the circulation. Due to the increased activity in the marrow, there may also be an increase in the release of immature cells into the circulation.

5. Is there any possible relationship between her past history and present complaint?

It is likely that the past episode of massive RBC destruction led to the release of bilirubin in high quantities, which may have contributed towards gallstone formation over a period of few months. This is now presenting with pain in the right hypochondrium.

6. What do you need to examine in this patient?

General physical examination; BMI need to be considered since cholelithiasis is more common in obese patients where cholesterol stones are formed.

Digestive system — this should include the following: abdominal palpation to confirm if any tenderness is present, and its exact location; any organomegaly especially liver or spleen; signs of jaundice in sclera; scratch marks for pruritus; Murphy’s sign for gallbladder inflammation.

7. What information can you obtain from these findings? Can you narrow your differential diagnosis?

There is no acute inflammation of liver or gallbladder. Her slight jaundice is consistent with spherocytosis given the fact that there is always some degree of
RBC destruction going on at all time. Further evaluation is required since the diagnosis remains ambiguous.

8. Explain the significance of the mild icterus in the sclerae.
She is jaundiced. Hyperbilirubinaemia causes yellow colouration not only of skin, but also mucous membrane. The sclera are covered anteriorly by the bulbar conjunctiva — a type of mucous membrane.

9. How would your differential diagnosis vary if:
   a. the patient complained of tenderness in the epigastric region instead
      Epigastric pain would shift the lines of thinking more towards gastric pain or pancreatic pain. A choledochal cyst is another possibility.
   b. if Murphy’s sign had been positive?
      Murphy’s sign is positive when there is active inflammation of gallbladder denoting acute cholecystitis.

10. What is the significance of splenomegaly in cases with haemolytic anaemias?
Due to an increased turnover of RBC in haemolytic anaemias, the workload on spleen increases. This is met by hypertrophy of the splenic tissue, thus presenting as splenomegaly.

11. What investigations are required following her referral to a medical practitioner? Why?
Since the patient is a diagnosed case of anaemia, a full blood count is required to assess her degree of anaemia. Secondly, liver function tests and serum bilirubin levels should also be requested as the patient had scleral icterus.

12a. What is a DISIDA scan?
A DISIDA scan is a nuclear scan that helps to evaluate the function of hepatobiliary system. It is performed to visualise the gallbladder filling and emptying. Technetium-99 is an isotope that is attached to a pharmaceutical agent (DISIDA) that allows visualising of the gallbladder. Images are taken that show the isotope leaving through the liver and then the gallbladder filling and finally tracer emptying into the small bowel.

b. What information in the microscopic section of gallbladder signifies presence of inflammation in the gallbladder?
Presence of inflammatory cells within lamina propria, partially stripped mucosa and thickening of gallbladder wall.

c. Why did the surgeon decide to operate even though the pathology result came back as mild chronic cholecystitis?
Even though the inflammation was not massive, the presence of multiple stones caused a constant threat of one of the stones being passed into the cystic duct and causing a severe colic attack, and chance of hepatic cholestasis. Therefore, prompt removal of gallbladder along with stones was necessary.

13a. Is there a need for further follow up in this patient?
Complications are rare after cholecystectomy, and usually there are no long-term effects. However, patients may notice temporary digestive difficulties after cholecystectomy and may have more frequent bowel movements. Some patients may experience chronic diarrhoea, bloating and upper abdominal pain. Very rarely, there may be development of post-surgical adhesions at a later date,
which may cause recurrent motility problems. In these cases there is a need for
follow-up.

In this particular case, the patient needs to have annual blood workup to
assess the level of anaemia and bilirubin levels for further management of her
spherocytosis.

b. What dietary advice should be given to Isha’s parents?
After cholecystectomy, the patient can continue to eat a normal healthy diet.
This is because the liver continues to produce enough bile for digestion.
However, instead of it being stored in the gallbladder, it is released directly in
to the gut in the form of slow continuous drops. Some patients may experience
occasional indigestion or bloating, more noticeable after eating fatty foods. In
these circumstances it is best to avoid excessive quantities of fats that require
large amounts of bile to be released. Adding more fibre to the diet may help
relieve symptoms as well.

14. Describe the pathophysiological mechanism associated with formation of
gallstones after severe haemolysis of red cells.
In case of severe haemolysis, there is premature destruction of RBC that
occurs at a much faster rate, resulting in release of higher levels of haemoglobin
from RBC. The released haemoglobin is ingested by the macrophages where
haem is further broken down to iron and biliverdin. This is then converted into
bilirubin. Free bilirubin is transported to the liver where it is conjugated and
excreted into bile. In haemolytic disease, the amount of bilirubin is too much
for the liver to process and therefore bilirubin level rises in blood and bile. This
bilirubin contributes towards formation of pigment stones.

15. What are the different types of gallstones?
There are three types of gallstones — cholesterol stones, pigment stones and
mixed variety.

CASE 5.5

1. Are you satisfied with the nurse’s impression of ‘a virus’? Explain your
answer.
Certainly, diagnoses of ‘a virus’ are often made frivolously and with great fre-
quency by busy practitioners, although this is usually a diagnosis of exclusion,
and of course the question always remains, ‘what virus?’ Since the symptoms
were relatively short in duration and the child appeared to have recovered, the
diagnosis of an otherwise unidentified viral infection is not completely unre-
asonable. However, the residual symptoms of swelling do warrant concern, and
may well have indicated a renal or metabolic problem. The parents probably
should have gone with their first instincts, but in retrospect, it is unlikely that
any further investigation would have been fruitful at that early point in the
pathophysiology of this complaint. The lesson here is that we shouldn’t be too
hasty to classify short-lived acute illness with the excuse of ‘a virus’. Patients
always deserve a full investigation of their illness.

2. What is the significance of the swelling that this child experienced?
Transient joint swelling is a common occurrence in many rheumatic disorders,
particularly when it involves the small joints. This is not necessarily a specific
marker for rheumatic disease since transient joint swelling can occur in
a number of other conditions. Some of these are benign, such as over-exercising, and others are not related to the musculoskeletal system, such as food allergies. However, the clinician is wise to consider rheumatic disease in any case of unexplained joint swelling.

3. **What are ‘growing pains’? Is this a legitimate diagnosis?**
   There is no specific identified condition known as ‘growing pains’ that is agreed upon by all health providers. Although this is really not a diagnosis at all, at the very best, it is a diagnosis of exclusion. Most often, it is a comforting phrase given to parents worried about their child’s pains when no diagnosis has been, or can be made. It is likely applied most commonly to muscle cramps that are probably related to simple over-use. Doctors should be cautious to avoid the tendency to use such terminology unless they have made a thorough search for the true cause of a patient’s pain. Once a child’s pain has been labelled as such, there is a higher probability of missing a latent disorder or disease as future pains will also likely be considered as ‘growing pains’ by the parents who may then not seek medical attention.

4. **What do you suppose concerned the chiropractor, and to what type of specialist was the patient referred?**
   The combination of multiple joint pains and fatigue concerned the chiropractor. Both of these are very common in the early stages of rheumatic disorders. The patient was referred to a paediatric rheumatologist.

5. **Is there any significance to the mother’s somewhat vague observation?**
   First of all, a major point is to be made: never, ever discount the observations of a mother about her child’s change in health or behaviour. Of course, the observations may have no significance, but it is always wise to investigate such observations further. As this case unfolds you may see that this observation may well have heralded the very early onset of pathophysiology.

6. **What are the key indicators of septic arthritis?**
   Septic arthritis, an acute infection of a joint, is indicated by the usual constitutional symptoms of infection (such as fever and chills), as well as signs and symptoms specific to infection and inflammation in a joint — severe pain (due to pressure on the sensitive joint capsule), redness, swelling and palpable heat. The pain can be particularly severe in these types of infection.

7. **As the child’s physical therapist, what might you be considering?**
   At this point, certainly rheumatoid arthritis should be considered. There is a myriad of rheumatic conditions capable of causing the same recurrent joint pains and inflammation. Often there are pathognomonic associated findings such as iritis or splenomegaly that might point one in the right diagnostic direction. However, this is a very specialised field and it is difficult to go much further than a general impression of rheumatologic disease without considerable further testing. This child is clearly not well and requires specialised consultation.

8. **What is the general significance of these physical signs?**
   These joint findings are ubiquitous. There is no pattern of overuse or a pattern of recurrent traumatic injury. There is clearly a generalised joint inflammatory condition that, at this point, still defies a more specific diagnostic label. Some
joints are painful yet not swollen; others are swollen but not painful. The additional information about increasing morbidity and functional limitations is significant.

9. **What is the significance of the 14/18 tender points and how should these points best be tested?**

The American College of Rheumatology guidelines for the diagnosis of fibromyalgia include the presence of tenderness at 11 or more of 18 agreed-upon sites, the so-called tender points. In this case, the rheumatologist reported tenderness at 14 of these 18 points. Clearly this was leading him to an impression of fibromyalgia. This process and diagnosis is troubling, however. Primarily, these tender points are not meant merely to be pushed on, and subjectively determined as painful or not. Having pain over these points is a common finding if enough pressure is applied. Many references refer to objective algometry readings where a point is considered positive if tenderness occurs at less than 4 kg of pressure. Hand held algometers are easy to use and fairly reliable. Certainly this gives more reliability than the subjective measure of simply pressing until the nail beds go white. Another point is to be made about fibromyalgia. Although the existence of fibromyalgia is now generally agreed upon, it remains a diagnosis of exclusion and requires a thorough search for the cause of generalised symptoms such as fatigue, joint pains, depression and gastrointestinal disturbances to be conducted before labelling a patient with this condition. In particular, systemic and rheumatic conditions must be ruled out by physical and laboratory examinations.[6]

10. **What might have caused the weight gain?**

Weight gain is a very general sign that may have multiple causes including normal growth, overeating, thyroid disease and other endocrine conditions, metabolic disorders, renal disease, and others. In this case, there is evidence from the chiropractor’s recorded growth of the child, that the child’s weight increased at a greater proportion than the child’s height. Note that the height remained at the same percentile over almost 2 years, but the weight increased rapidly, tending to rule out normal growth. The child’s mother admitted that his physical activity was reduced as a consequence of the joint pains, but in general he was still active and not overeating. You may recall in the earlier history that the mother noticed that her son ‘felt different’ when she hugged him. She may have been noticing interstitial oedema which could indicate a metabolic or renal cause for the weight gain. Such subjective observations are not to be ignored.

11. **While the child’s parents felt satisfied that the specialist had provided an appropriate opinion, the chiropractor was suspicious that the condition had not been properly investigated. Why?**

The chiropractor felt that the multiple joint pains and unexplained weight gain had not been fully explained or investigated. ‘Reactive arthritis’ is a term used to describe joint inflammation that is considered as an abnormal immune reaction to an infection (and the child certainly did have signs of an infection years earlier at the summer camp). The term has replaced that of ‘Reiter’s syndrome’, which includes conjunctivitis, urethritis and arthritis. In this case, the child only had one of these three conditions (arthritis).
12. What is the significance of these new findings?
The haematuria is ominous and may indicate renal involvement. In this case, the urine was extremely dark but contained no gross blood on visual examination, leading to the suspicion of a renal cause. There are a number of rheumatic conditions that include renal involvement, such as systemic lupus erythematosus (SLE), Wegener’s granulomatosis, and rheumatoid arthritis.

13. What is the most likely diagnosis? What are the cardinal features of this disorder?
The diagnosis is Wegener’s granulomatosis. This is a necrotising granulomatous vasculitis, with patients usually presenting in their fourth to fifth decade. The typical triad is involvement of the upper respiratory tract (sinus symptoms and epistaxis), lower respiratory tract (cough, haemoptysis), and kidneys (nephritis). Joint pains are often seen, as are other typical elements of rheumatologic disease in general.[7]

14. What is causing the child’s oedematous appearance?
The oedematous appearance is caused by iatrogenic Cushing’s syndrome due to the high levels of corticosteroids used to control the Wegener’s symptoms. Like many hormones, corticosteroids show toxic effects which are the logical outcome of exaggeration of their physiological effects. Accordingly, large doses result in sodium and water retention and the redistribution of adipose tissue, giving rise to the appearance of truncal obesity, typically sparing the limbs.

15. What kinds of conditions are these medications commonly used to treat?
These medications are immunosuppressants and they are typically used to prevent or inhibit the function of the immune system. They are typically used to treat auto-immune diseases (including Wegener’s granulomatosis). They are also used to prevent or reduce the likelihood of rejection following organ transplants and occasionally they are used in non-autoimmune inflammatory diseases such as chronic asthma. They are powerful drugs which must be used carefully due to the toxic nature of their side-effects.

16. His current medications include drugs to assist with blood pressure regulation and calcium metabolism. Why?
His renal function has been severely reduced due to the Wegener’s granulomatosis. Accordingly, he has renal-induced hypertension that must be controlled for the remainder of his life. At this point in his progress, the reduction of renal function is his greatest concern and the reason he is on the waiting list for a kidney transplant. Also, his chronic use of corticosteroid medication puts him at great risk for osteoporosis and weight-bearing fractures, hence his need for medication to reduce his calcium loss.

17. Speculate on when this disorder actually might have begun in this patient (as distinct from when it was formally diagnosed).
While this is purely speculative, one wonders, in hindsight, whether the autoimmune disorder had its origins in the viral infection at the summer camp (or perhaps even as far back as the traumatic automobile injury in his early childhood, following which his mother stated that he was never quite the same). In any case, the pathophysiology began earlier than the pathologic signs and
symptoms (as occurs in so many diseases) and it is the great challenge of health providers to be vigilant in their search for early departures from normal function.

CASE 5.6

1. What is the typical description of:
   a. common migraine
   b. classic migraine?

The Headache Classification Committee of the International Headache Society (IHS)\(^8\) defines migraines as having the following characteristics: unilateral location, pulsating quality, moderate or severe intensity, aggravated by routine physical activity. During the headache the person must also experience either nausea and/or vomiting, photophobia and/or phonophobia. In addition, there is no suggestion either by history, physical or neurological examination that the person has a headache listed in groups 5–11 of their classification system.

Migraine is a complex condition, with many sub-types, and as a result many potential treatments. Unfortunately, the prevalence of migraine and headache is still large with approximately 12% of the population experiencing migraine, and a further 40–80% experiencing other types of headache.\(^9\) In addition, several studies have noted that the incidence of migraine is often under-reported, and that migraine is under-treated.

Data from the American Migraine Prevalence and Prevention study,\(^10\) reports that migraine incidence peaked between the ages of 20 and 24 years in women (18.2/1000 person-years) and the ages of 15 and 19 years in men (6.2/1000 person-years). Cumulative incidence was 43% in women and 18% in men. Median age of onset was 25 years among women and 24 years among men. Onset in 50% of cases occurred before age 25 and in 75% before age 35 years. Four of every 10 women and two of every 10 men will contract migraine in their lifetime, most before age 35 years. The incidence estimates from this analysis are consistent with those reported in previous longitudinal studies (Stewart 2008).\(^11\)

### Table 5.1 Migraine without aura

<table>
<thead>
<tr>
<th>Migraine without aura (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Headache attack lasting 4–72 hours with pain free periods</td>
</tr>
<tr>
<td>2. Pain characteristics (at least two are necessary):</td>
</tr>
<tr>
<td>(a) unilateral location</td>
</tr>
<tr>
<td>(b) pulsating quality</td>
</tr>
<tr>
<td>(c) moderate or severe intensity</td>
</tr>
<tr>
<td>(d) aggravated by routine physical activity</td>
</tr>
<tr>
<td>3. Symptoms during the headache (at least one required):</td>
</tr>
<tr>
<td>• nausea and/or vomiting</td>
</tr>
<tr>
<td>• photophobia and/or phonophobia</td>
</tr>
<tr>
<td>4. There is no suggestion either by history, physical or neurological examination that the person has a headache listed in groups 5–11 of the classification system</td>
</tr>
<tr>
<td>5. The person needs to have at least five such attacks fulfilling criteria 1–4 above</td>
</tr>
</tbody>
</table>
2. List the intracranial and extracranial causes of headache.

It is estimated that there are more than 300 potential types or causes for headache, making headache diagnosis one of the more complicated areas of healthcare. The purpose of this case is to give a comprehensive review of the different types of headaches and their associated treatments. The causes of headaches range from the benign to the malignant, and symptoms may range from a slight discomfort to an extreme disability. A small number of headaches, including migraine, sometimes do not respond to treatment, or can be indicative of a serious condition. These may have serious consequences, therefore, there is a need for these conditions to be diagnosed promptly.

Table 5.3 Extracranial and intracranial causes of headache[12]

<table>
<thead>
<tr>
<th>Extracranial</th>
<th>Intra-cranial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical zygapophyseal joints</td>
<td>Brain tumours</td>
</tr>
<tr>
<td>Cervical spine arteries (including the vertebral artery)</td>
<td>Space occupying lesions (haematoma, abscess)</td>
</tr>
<tr>
<td>Trigger points</td>
<td>Subarachnoid haemorrhage</td>
</tr>
<tr>
<td>Third occipital neuralgia</td>
<td>Meningitis</td>
</tr>
<tr>
<td>Suboccipital muscles</td>
<td>Aneurysm</td>
</tr>
<tr>
<td>Cervical spondylosis</td>
<td>Posterior fossa lesions</td>
</tr>
<tr>
<td>Occipital neuralgia</td>
<td>Cerebral artery haemorrhage</td>
</tr>
<tr>
<td>Accessory nerve neuroma</td>
<td>Raised intra-cranial pressure</td>
</tr>
<tr>
<td></td>
<td>Encephalitis</td>
</tr>
<tr>
<td></td>
<td>Angioma</td>
</tr>
</tbody>
</table>

3. What are the key headache types and their most common features?

<table>
<thead>
<tr>
<th>Type</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergy headaches</td>
<td>Facial (frontal) headache. Nasal congestion, watery eyes. Commonly seasonal (eg: spring)</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>Strong symptoms may mimic frequent migraine or cluster headaches. sudden, unbearable headache (10/10 on pain scale), double vision, rigid neck. Individual rapidly becomes unconscious</td>
</tr>
</tbody>
</table>
### Type Symptoms

<table>
<thead>
<tr>
<th>‘Arthritis’ headaches</th>
<th>Pain at the back of head or neck. Aggravated by movement. Caused by irritation of the nerves in the neck, and may produce blood vessel inflammation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicogenic headache</td>
<td>Pain at the back of head or neck, but can project forward. Aggravated by movement. Pain can be reproduced by specialised movements. Responds with spinal manipulative therapy (SMT)</td>
</tr>
<tr>
<td>Caffeine-withdrawal headaches</td>
<td>Throbbing headache caused by rebound dilation of the blood vessels, occurring multiple days after consumption of large quantities of caffeine</td>
</tr>
<tr>
<td>Cluster headaches</td>
<td>Excruciating pain in vicinity of eye. Tearing of eye, nose congestion, flushing of face. Pain frequently develops during sleep and may last for several hours. Attacks occur every day for weeks/month, then disappear for up to a year. 80% of cluster patients are male, most ages 20–50</td>
</tr>
<tr>
<td>Exertion headaches</td>
<td>Generalised head pain of short duration (minutes to 1 hour) during or following physical exertion (running, jumping, or sexual intercourse), or passive exertion (sneezing, coughing, moving one’s bowels, etc.)</td>
</tr>
<tr>
<td>Eyestrain headaches</td>
<td>Usually frontal, bilateral pain, directly related to eyestrain. Subtle cause of headache that may be difficult to diagnose</td>
</tr>
<tr>
<td>Fever headaches</td>
<td>Generalised head pain that develops with fever. Person feels generally unwell</td>
</tr>
<tr>
<td>Hangover headaches</td>
<td>Migraine-like symptoms of throbbing pain and nausea not localised to one side</td>
</tr>
<tr>
<td>Hunger headaches</td>
<td>Pain strikes just before meal-time. Caused by muscle tension, low blood sugar, and rebound dilation of the blood vessels, oversleeping or missing a meal</td>
</tr>
<tr>
<td>Hypertension headaches</td>
<td>Generalised or ‘hairband’ type pain, most severe in the morning. Diminishes throughout day</td>
</tr>
</tbody>
</table>

4. Do these physical examination findings suggest a cause of his headaches other than migraine?

No.

5. What methods could Lawrence (and his mother) use to help establish a pattern to his headache, and understand if any future treatments are working?

There are several methods to help any future treatments to work, but a very effective method is a migraine diary.

By keeping a headache diary the individual may be able to identify a pattern for the headache, which may include environmental causes, dietary factors, lifestyle or stressful events that have contributed to the headache.

Factors that should be recorded for each headache include:

<table>
<thead>
<tr>
<th>Date and time</th>
<th>trigger factors</th>
<th>Severity (1–10 scale)</th>
<th>Medication</th>
<th>Duration</th>
<th>Disability</th>
</tr>
</thead>
</table>
Key
The scale below can help describe the severity of the pain experienced.

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>None</td>
<td>slight</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>Worst</td>
<td></td>
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</tbody>
</table>

The following may help to establish a pattern:
- Trigger factors (eg: stress, poor sleep, weather changes, foods, etc.).
- Medication – what was taken and how well did it work?
- Duration – how long before the migraine stopped?
- Disability – when could normal activities be resumed?

It may also be helpful for Lawrence and his mother be aware of some of the dietary factors which can precipitate migraine in some individuals. These may include:
- peanuts, peanut butter, other nuts and seeds
- caffeine foods: chocolate and cocoa; coffee, tea and cola
- food additives or preservatives, nitrates and nitrites (eg: potato chips, cordials)
- aspartame and other artificial sweeteners
- ice cream and other cold foods
- alcohol: red wine, beer, whiskey, and champagne
- cured/processed meats, hot dogs, ham, sausage, pepperoni, bacon, deli-style meats
- monosodium glutamate, oriental foods, and some packaged foods
- bread, crackers and desserts containing cheese
- pizza
- yeast baked goods
- chicken livers and other organ meats
- smoked or dried fish
- certain fresh fruits including ripe bananas, citrus fruits, papaya, red plums, raspberries, kiwi, pineapple
- cheeses: blue, brie, stilton, feta, mozzarella, gorgonzola, parmesan, Swiss, cheddar, and processed
- dried fruits (figs, raisins, dates)
- cultured dairy products, sour cream, buttermilk, yoghurt.

6. What specific questions or other testing would help you assess a child with a headache?

Questions to be asked for every child with recurrent headaches:
- Personal details and demographics (eg: date of birth, gender, socioeconomic status).
- When was the first incidence of your head pain?
- Was there an initial event you can recall?
- Please describe features for a typical episode.
- How often does it occur?
- Has a pattern to the headaches been observed by the child or caregiver?
- How long does the pain last?
- How are the daily activities affected by the pain?
- How severe is it?
- How does the headache make you feel?
PART 2 • Answers to case studies

- Where is the usual location of the pain?
- Any associated neck pain symptoms?
- Pain location: unilateral; bilateral; local; diffuse/vague; radiating?
- Any associated symptoms?
- Daily features: trigger factors, aggravating factors, relieving factors?
- What have been the previous treatments?
- What is the medical and surgical history?
- Is there a history of trauma: falls and/or injuries, broken bones and/or fractures?
- Has there been, or is there, a serious illness(es)?
- What is the current medication?
- Is there a family history of migraine?

Physical examination testing may include:
- Full neurological examination, including cranial nerves.
- Examine head and neck region for a possible source of the headaches.
- Cervical spine:
  - cervical range of motion (ROM)
  - cervical muscle testing — active, passive and resisted tests to assess tone/strength, hypertonicity
  - reproduction of presenting head pain and/or migraine sensation (eg: springing)
  - motion palpation of upper cervical spine.
- Ideally other systems should also be examined.

7. What is your final diagnosis, based on these results? Justify your answer.
There are many missing history factors and examination findings provided in order to confirm a precise diagnosis. However, the most likely diagnosis appears to be a migraine without aura.
- DDx 1: migraine without aura:
  - throbbing headache
  - pain causes cessation of normal daily activities (ie: school)
  - photophobia.
- DDx 2: sinus headache:
  - location of the pain
  - insidious onset
  - pain is localised to frontal region
  - seasonal pattern hasn’t been excluded.
- DDx 3: allergies:
  - history of asthma
  - dietary triggers.

8. Are headaches a common complaint in the paediatric population?
Headaches are believed to be the most common type of pain presentation in children. Refer to Kernick for more detail.¹³

References

Further reading