Chapter 14
Back Pain in Adolescence and Young Adulthood

Verna Cuthbert

Introduction

Back pain in adolescence is more prevalent than previously thought. A systematic review of back pain found lifetime prevalence ranged from 4.7% to 74.4% adolescents and was thought to be due to the wide variation in how this was defined and reported [1]. Adolescents are less likely to have a disc prolapse, suffer from spondylotic changes in the spine or be affected by spinal stenosis, compared with adults. Back pain in Adolescence and young adults (AYA) is less likely to be due to serious pathology compared to children below age of 12. Adolescents report both thoracic and lumbosacral back pain equally, whilst adults tend to report more lumbosacral back pain, and younger children report thoracic pain. Adolescents are more likely to suffer back pain related to overuse and injury, particularly if they participate in sports.

Studies have shown links between adolescent back pain and chronic pain in adults [2]. Similar to findings in adults,

V. Cuthbert (✉)
Department of Paediatric and Adolescent Rheumatology, Royal Manchester Children's Hospital, Manchester University Hospitals NHS Trust, Manchester, UK
e-mail: Verna.cuthbert@mft.nhs.uk

J. E. McDonagh, R. S. Tattersall (eds.), *Adolescent and Young Adult Rheumatology In Clinical Practice*, In Clinical Practice,
https://doi.org/10.1007/978-3-319-95519-3_14

Table 14.1 Potential risk factors for back pain in young people [3]

Gender – Adolescent girls report spinal pain more frequently than boys.
Age – The prevalence of spinal pain increases from childhood to adolescence from 10 to 12 years onwards.
Family history of back pain.
Mechanical load, e.g. heavy bags and asymmetrical load such as heavy school bags may play a role especially in taller young people though evidence is unclear.
Smoking – Linked to an increase in risk of back pain.
Physical activity and sports.
Psychosocial factors – Anxiety, emotional and behavioural problems, depressive symptoms and sleep problems more likely. Negative psychosocial experiences, e.g. parental divorce.
Co-occurrence of other somatic symptoms, e.g. headaches, abdominal pain.

studies have shown an association between multi-site musculoskeletal (MSK) pain, of which back pain is a common site, and with psychological problems in adolescents, specifically anxiety and low mood. The latter may commonly present as physical symptoms and therefore vital for Health Care Professionals (HCPs) to provide holistic developmentally appropriate care, including psychosocial assessment to provide early and effective intervention and thus reduce disability and the likelihood of symptoms becoming a chronic problem into adulthood. Factors to address during this assessment are detailed in Table 14.1.

Causes of Adolescent and Young Adult Back Pain

The differential diagnosis of back pain in adolescents and young adults is listed in Table 14.2.

Table 14.2 Causes of AYA back pain

Non-specific – Majority
Mechanical – Hypermobility (see Chap. 11), postural, mechanical load, Scheuermann's, spondylosis, spondylolisthesis, idiopathic scoliosis, disc related
Inflammatory – Enthesitis-related JIA (ERA), ankylosing spondylitis (if onset >16 years) (see Chap. 7)
Metabolic – Osteoporosis both idiopathic and secondary, e.g. eating disorders (see Chap. 16)
Vascular – sickle cell, arteriovenous malformation,spinal infarct
Infectious – osteomyelitis, discitis, epidural abscess
Tumour – Benign (osteoid osteoma), malignant (Ewing's sarcoma, osteosarcoma and lymphoma), spinal cord
Referred pain – Hip, sacroiliac, abdomen, pelvis, thorax (pneumonia, pleuritis), gynaecological (pelvic inflammatory disease or ovarian pathology)
Idiopathic pain syndromes (see Chap. 12)

National UK guidelines [4, 5] suggest the importance of risk stratification using assessment tools, e.g. STarT Back Risk Assessment Tool which helps in the identification of young people over 16 years at risk of their back pain becoming chronic. A comprehensive history including relevant psychosocial assessment in young people, such as the HEADSSS assessment [6] (see Chap. 4) and general and physical examination (see Chap. 6), should reveal more serious aetiologies and guide the HCP towards appropriate investigation and management.

Clinical Presentation of Back Pain in Young People

Symptom pattern recognition is the key to diagnosis in any age group, and AYAs are no different. Key points will be highlighted here as extensively reviewed elsewhere [7–10].

Symptom Pattern and Spinal Red Flags

Spinal red flags are listed in Table 14.3. These symptoms may be characteristic of serious conditions such as infection, tumours, inflammatory bowel disease IBD or rheumatic diagnoses. Bone-related pain tends to occur centrally in the spine, is usually exacerbated by extension and can be aggravated by percussing the spinous processes. Malignant tumours are more likely to present with neurological signs and symptoms. Scoliosis associated with severe pain, a very rigid scoliosis, rapid progression and lack of compensatory curves above or below should be regarded as worrying and investigated as possible serious pathology. The most common benign tumour in adolescence is osteoid osteoma and may be reported in the history to be relieved by NSAIDS. Chronic recurrent multifocal osteomyelitis can rarely present as back pain (see Chap. 17). Common infectious causes include vertebral osteomyelitis (most common in the lumbosacral spine), discitis and epidural abscess (more common in adolescent males). Discitis is less common in adolescence compared with younger children and less severe than the adult-onset form. Discitis most frequently affects the thoracic and lumbar spine, and usually only one disc space is affected. If more than one level is affected, TB should be excluded. Exposure to TB and recent

Table 14.3 Spinal red flags

Constant severe back pain
Nocturnal pain
Systemic symptoms such as fever, weight loss, malaise, or night sweats,
Limping or refusal to mobilize
Muscle spasm
Cauda equina symptoms
Severe or rapidly progressing neurological deficit

foreign travel should be elicited in the history taking. A history of intravenous drug use increases the risk in this age group. Young people with sickle-cell anaemia may develop a vaso-occlusive crisis in their spine, may be more prone to osteomyelitis and may present acutely with red flag features. Fractures due to primary (idiopathic juvenile osteoporosis) or secondary osteoporosis (see Chap. 16) may present with localized bony pain.

Investigations

Subjective and objective examination suggesting serious pathology warrants concern and further investigation. This is likely to include bloods, MRI, CT and DEXA bone scan (if osteoporosis suspected). If infection or systemic disease suspected, a sepsis screen including blood cultures, blood film, inflammatory markers and HLA-B27 may be useful. MRI does not require radiation exposure and provides better visualization of soft tissue and spinal canal and thus indicated when disc pathology or neural compromise suspected. Computed tomography (CT) has superior depiction of cortical bone than MRI. Thus, when bony anatomy is critical, CT is preferable. Isotope bone scans are less often used nowadays and are used mainly to detect occult fractures, stress fractures or bony metastases. A drawback of lumbar radiography (including CT and isotope bone scans) is gonadal exposure to ionizing radiation, especially with oblique view or multiple exposures.

Adolescent Mechanical Back Pain

"Mechanical" back pain (see Table 14.2) is related to movement, positions and forces. It is usually intermittent in nature. Symptoms are usually related to postures, positions or movement. Pain is usually worse later in the day or after activity.

Scheuermann's Disease

Scheuermann's commonly affects males aged 12–18 years. Abnormal growth of different parts of the young person's vertebrae during the growth spurt causes some of the vertebrae to become wedge shaped. Scheuermann's is associated with Schmorl's nodes: protrusions of the intervertebral disc into the cancellous bones of the vertebral body. The aetiology is unknown. Prevalence is between 0.4% and 8% of the population. There is commonly between 20° and 45° kyphosis. Scheuermann's is known to be associated with a higher incidence of disc degeneration, and one third typically have a degree of scoliosis.

Young people may present with thoracic pain and a thoracic kyphotic deformity (about which they may feel very self-conscious) and complain of intermittent back aching and/or fatigue particularly at the end of the day or after activity. Clinical features include altered posture – a forward head position, lumbar lordosis, rounded shoulders, possible contractures of the shoulder and hip joint, a protruded abdomen and tight hamstrings. A structural kyphosis will still be present in prone lying; a postural kyphosis on sitting will disappear in a prone position. Forward Adams Test will reveal the presence of a scoliosis. The adolescent is asked to bend forward until back in horizontal plane with arms hanging and knees in extension, and the HCP then looks for abnormalities of the spinal curve and/or asymmetry of the trunk. In severe but rare cases, there may be cardiopulmonary compromise or neurological symptoms. Further investigations include lateral X-ray and/or MR scan if disc degeneration or neurological compromise suspected. The management of young people with Scheuermann's includes physiotherapy, bracing and in the most severe cases, surgery.

Spondylolysis or Pars Defect

Spondylolysis is a condition in which there is a defect in the pars interarticularis of the vertebra which may be unilateral or bilateral commonly found at the L5/S1 level and can occur at L4/L5 but rarely higher. It has been proposed that pars

defects are due to stress fractures and there is thought to be a genetic predisposition. This commonly affects sporty teenagers participating in extension-type activities, e.g. gymnastics, cricket (particularly bowling), basketball, football, dancing and swimming. If spondylolysis occurs bilaterally, this can give rise to a slip either anteriorly of one vertebra on the one below – spondylolisthesis – or, less commonly, posteriorly (retrospondylolisthesis). Progression of a spondylolysis to a spondylolisthesis occurs in approximately 15% of cases, and this generally occurs during the teenage growth spurt and rarely changes after age 16.

A high-grade spondylolisthesis (slip >50% of the anteroposterior vertebral body width) may present with symptoms commonly at the lumbosacral level, particularly worse after sport/activity and extension movements and relieved by rest. Clinical signs may reveal a palpable step from the sacrum to the spinous process of L5 if a spondylolisthesis is present at this level. Back pain may be reproduced with spinal extension movement. Hamstrings may be restricted. Management of spondylolysis in young people includes rest, bracing, physiotherapy and for some, surgery.

Postural Back Pain

Muscular back pain is thought to be commonly caused by asymmetrical forces acting through the spine such as carrying a heavy school bag over one shoulder; poor sustained posture/positions, e.g. "I-pad neck"; or heavy use of gaming consoles. The evidence base however remains unclear [11]. A pelvic tilt caused by a leg length discrepancy can contribute to mechanical back pain. Symptoms are often reported to come on after a time delay. There is often little to see on clinical examination. Reassurance and education re prevention with advice on simple pain relief measures, postural correction exercises and core strengthening/endurance can help. Referral for consideration of leg length correction with a shoe raise may be indicated.

There may be an association with psychosocial factors such as anxiety and depression (see above), and developmentally

appropriate psychosocial assessment and referrals to the multidisciplinary team MDT if appropriate should be considered.

Disc-/Nerve Root-Related Pathology

Approximately 10% persistent adolescent back pain is thought to be due to a disc-related problem and is much less common than in adults. The risk is higher in adolescent males; sporty adolescents, especially activities such as weight lifting, wrestling, gymnastics and impact sports; and those with a history of disc-related back pain in the family. It may commonly occur following trauma. Symptomatic disc degeneration may start in adolescence and is best detected on MR scan.

Back pain caused by a disc-related problem is usually exacerbated by forward flexion and may radiate and even change sides. Disc pathology can be accompanied by acute deformities of the spine.

Advice with regard to self-management, keeping active, continuing with daily tasks as possible and/or referral to a musculoskeletal adolescent physiotherapist for advice, pain management and treatment should be considered. Referrals to wider MDT may be indicated if psychosocial factors present.

Adolescent Idiopathic Scoliosis

Scoliosis is common during adolescence. Studies suggest prevalence of a detectable scoliosis is approximately 10% of adolescents and AYA. Scoliosis is a lateral deviation from the midline of the spine of at least 10°, and most cases are idiopathic and do not cause pain. Postural scoliosis may be due to leg length discrepancy, muscle weakness and/or unilateral tightness causing pelvic tilt, and management will need to be directed accordingly. A structural scoliosis has a rotational component and is the most common type in adolescence. If unsure whether a scoliosis is postural or structural, sit the young person on a plinth – postural scoliosis will disappear when sitting.

The time of peak progression of a curve is at the beginning of puberty. The older the adolescent becomes, the less likely a curve will progress. The greater the curve at presentation, the more likely it is to progress, and adolescent girls have a much greater chance of their scoliosis progressing to be clinically significant. A curve in the thoracic spine is more likely to progress than a lumbar curve.

In order to screen for scoliosis, then the young person should be adequately undressed so the clinician can see the spine from the waist up. The examiner looks for signs such as asymmetry of shoulder levels, asymmetry of scapulae, tilting of the hips or unequal waist creases and then asks the young person to bend forwards with knees extended (Forward Adams Test) to examine for a rib hump and/or a lateral curve of the spine.

Knowledge of the factors likely to predict a worsening of a scoliosis will guide management. Female adolescents who are early in puberty and who have an obvious scoliosis on presentation be referred to a paediatric spinal surgeon for monitoring or possible treatments including bracing or instrumented correction.

In summary, a young person presenting with back pain needs a developmentally appropriate assessment with particular reference to any red flags. Management will depend on the underlying cause [12], but a multidisciplinary approach is the ideal.

Key Management Points

1. Most back pain in adolescents is non-specific and non-serious with no demonstrable cause.
2. Comprehensive developmentally appropriate history taking is important, asking about possible lifestyle, mechanical loading, family history, sporting and leisure activities.
3. Awareness of psychosocial factors linked with musculoskeletal symptoms and back pain presentations is important in order to offer early intervention.

4. Prepubertal children are more likely to have serious pathology. Recognition of spinal red flags and appropriate targeted investigation to rule out serious pathology is imperative.
5. Pubertal assessment is important to determine risks from structural abnormalities during growth spurt.
6. Recognition of need for holistic management and referral to wider MDT is important.

References

1. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a systematic overview of the research literature. Spine. 2007;32(23):2630–7.
2. Kamper SJ, Henschke N, Hestbaek L, Dunn KM, Williams CM. Musculoskeletal pain in children and adolescents. Braz J Phys Ther. 2016;20(3):275–84.
3. Kamper SJ, Yamato TP, Williams CM. The prevalence, risk factors, prognosis and treatment for back pain in children and adolescents: an overview of systematic reviews. Best Pract Res Clin Rheumatol. 2016;30(6):1021–36.
4. National Institute for Health and Care Excellence Low back pain and sciatica in over 16s: assessment and management guideline NG 59. Nov 2016. https://www.nice.org.uk/guidance/ng59.
5. National Institute for Health and Care Excellence Low back pain and sciatica in over 16s. Quality Standard QS155. July 2017. https://www.nice.org.uk/guidance/qs155.
6. Doukrou M, Segal TY. Fifteen-minute consultation: communicating with young people-how to use HEEADSSS, a psychosocial interview for adolescents. Arch Dis Child Educ Pract Ed. 2018;103(1):15–9.
7. Houghton KM. Review for the generalist: evaluation of low back pain in children and adolescents. Pediatr Rheumatol Online J. 2010;8:28. https://doi.org/10.1186/1546-0096-8-28.
8. MacDonald J, Stuart E, Rodenberg R. Musculoskeletal low Back pain in school-aged children: a review. JAMA Pediatr. 2017;171(3):280–7.

9. Patel DR, Kinsella E. Evaluation and management of lower back pain in young athletes. Transl Pediatr. 2017;6(3):225–35.
10. Sato T, Ito T, Hirano T, Morita O, Kikuchi R, Endo N, Tanabe N. Low back pain in childhood and adolescence: assessment of sports activities. Eur Spine J. 2011;20(1):94–9.
11. Yamato TP, Maher CG, Traeger AC, Wiliams CM, Kamper SJ. Do schoolbags cause back pain in children and adolescents? A systematic review. Br J Sports Med. 2018;52(19):1241–5.
12. Calvo-Munoz I, Gomez-Conesa A, Sanchez-Mecca J. Physical therapy treatments for low back pain in children and adolescents: a meta-analysis. BMC Musculoskelet Disord. 2013;14(1):55.