



An Overview in the Management of Lumbar Degenerative Disc Diseases: Review Article

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i43B32566

Editor(s):

(1) Dr. Sachin Kumar Jain, IPS Academy College of Pharmacy, India.

Reviewers:

(1) Juan Esteban Muñoz Montoya, Universidad Militar Nueva Granada, Colombia.

(2) Özgür Demir, Gaziosmanpaşa University, Turkey.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/73503>

Review Article

Received 28 June 2021

Accepted 08 September 2021

Published 14 September 2021

ABSTRACT

The degenerative disease of the intervertebral disc and back pain are chronic conditions that are caused by several factors and represent an important cause of morbidity and mortality in everyday clinical practice. The study aims to summarize the updated evidence regards epidemiology, pathophysiology, clinical manifestation, diagnosis, and management of degenerative disc diseases. The incidence of low back pain, which is the main symptom in Intervertebral Disc (IVD) disease, varies widely among different reports. It is the fifth most common cause for the visit to the

doctor and affects 7.6 to 37% of patients. IVD degeneration is attributed to a complex interplay between environmental and genetic factors. DDD is a process that includes a progressive decrease in disk nutrient supply and changes in extracellular matrix (ECM) composition, which weakens the tissue strength and alters the cell metabolism. Degenerative lumb disc disease patients typically present with mechanical lower back pain, which is worse on forward flexion and when carrying heavy load. The pain is relieved with rest. Diagnosis of DDD is done by various methods, computed tomography (CT) scan, magnetic resonance imaging (MRI), and provocative discography. These methods should be used in conjunction with the patient history, physical examination and specific biomarker to monitor the response to treatment. There are three major lines of management of DDD; Treatment Options for Relief of Pain in Conservative Therapy. Treatment with Aims of Restoration, Repair, and Regeneration of Intervertebral Disc Diseases: Molecular Therapy. Reconstructive Strategies: Percutaneous Intervertebral Disc Techniques. Definitive Treatment for Intervertebral Disc Diseases :(surgical management).

Keywords: Lumbar degeneration; lumbar disc diseases; management; lower back pain.

1. INTRODUCTION

Low back pain is the most frequent chronic pain condition, leading to disability, increased risk of falling, and depression, as well as substantial societal costs, impairment, and health consequences [1]. Disc desiccation [low signal intensity on T2-weighted magnetic resonance imaging (MRI)], which is a common finding in adults irrespective of symptoms, to particular symptomatic disorders, like disc herniation with concordant radiculopathy [2].

The degenerative disease of the intervertebral disc and back pain are chronic conditions that are caused by several factors and represent an important cause of morbidity and mortality in everyday clinical practice [3]. It is a common condition characterized by the breakdown (degeneration) of one or more of the discs that separate the bones of the vertebrae, causing pain in the back or neck as a consequence of the cell-mediated response to multifactorial contributions, such as genetics, micro/macro trauma, accelerated age-related changes, inflammation, local nutritional deficiency, and vascular factors, leading to excess catabolic over anabolic responses. The intervertebral discs IVD, provide cushioning between vertebrae and absorb pressure put on the spine [4]. IVD disorders can affect both the young and old population. Treatment strategies need to consider age of presentation, comorbidities, severity of IVD, neural elements compression and stability of the spinal column, many of the restorative and reconstructive management strategies are still at the early stages of laboratory experimental and animal trials, with clinical efficacy yet to be proven [5]. Degenerative disc disease (DDD) and prolapsed

intervertebral disc (PID) are the two commonest forms of IVD diseases. They have a close cause and effect relationship as a prolapsed intervertebral disc is a risk factor of degenerative disc disease while advanced degenerative disc often presents with disc prolapse with annular fissure due to degeneration leading to a fragmented disc being prolapsed into the spinal canal [6].

Physical exercise is clinically recommended in several guidelines to help in alleviating pain [5]. Physical exercise helps in IVD cell proliferation in animal model studies, particularly in moderate to high volume low repetition and frequency exercises [6]. It has an effect on paraspinal muscle strength and aids in reducing pain and disability [1]. Up to 80% of patients with a prolapsed intervertebral disc respond to conservative therapy in an average of 4 to 6 weeks [2].

Kjaer et al. showed that most lumbar disc herniation (65%) does not change in size over a 4- to 8-year period, with 17.5% decreasing in size, 12.5% increasing in size, and 5% showing various changes in disc sizes. Large disc herniation tended to decrease the dural sac area and disc height over time [6]. Hence, the role of conservative therapy is mainly on improving the physical well-being of the patient and provides a platform for adaptation of the body while waiting for the inflammatory phase of disc herniation to subside.

2. OBJECTIVES

This review article aims to provide an overview of the different options in the management of degenerative disc disease.

3. EPIDEMIOLOGY

Lumbar back pain affects 70–85% of people at a certain point in their lives [3]. Back pain is more common as people age, and up to 85% of people will have it again in their lives [4]. In people between the ages of 45 and 65, chronic low back pain (LBP) remains the main reason of debility [5]. A prospective study using MRI on 67 asymptomatic individuals ranging in age from 20 to 80 years old (average 42 years old) found a significant abnormality in 28% of the participants, with 24% having herniated nucleus pulposus and 4% having spinal canal stenosis. Around 34% of the younger age group and all but one of the older age groups had at least one degenerated disc. Nearly half of all degenerative discs have bulged irrespective of age. The prevalence of these abnormalities was the same in both genders; however, it varies across the age group. Despite all aberrant lumbar disc findings on MRI, it is most dependable on symptomatic patients under the age of sixty [6].

4. PATHOPHYSIOLOGY OF DDD

DDD is caused by a complex combination of structural, genetic, environmental, trauma, and age factors. These changes cause a decrease in pH and oxygen concentration. Calcification of endplates evolved as a result of these alterations, which led to a reduction in nutrient flow and blood supply, resulting in additional disc dysfunction in response to microtrauma. Pathological pain-triggering pathways generated by stimulation of inflammatory pathways with its secreted cytokines lead to an inflammatory response that leads to neuropathy of the diseased IVD tissues frequently results in a cascade of catabolic processes in the disc, which is related to the onset of DDD [7].

5. MECHANICAL LOAD

Long-term and excessive exposure to high mechanical loads have been shown to have detrimental effects on in vitro diagnostics, Low rate of loading, on the other hand, is critical for forced convection, which aids in the distribution of nutrients to both normal and degenerative discs [7].

6. GENETICS AND DEGENERATED DISC

DDD is considered to be linked to genes that influence IVD structure, catabolic cytokines polymorphisms, and inflammatory cascade

cytokine polymorphisms [7]. Variations in the genes producing Type II collagen, a key component of the NP and inner AF extracellular matrix (ECM) [8].

7. ENVIRONMENTAL AND PSYCHOSOCIAL FACTORS ASSOCIATED WITH DDD

Smoking, obesity, and diabetes mellitus are all linked to DDD. Smoking has the greatest connection to DDD of the three variables, and their impact is synergistic [7].

8. VITAMIN D AND DEGENERATED DISC

Polymorphisms in the growth differentiation of factor 5, vitamin D receptor, and matrix degradative protease genes, among others, have been associated with IVD. however, the amount of each genes effect on the illness remains unclear [8].

9. AGING AND DEGENERATED DISC

In the early stages of DDD, enhanced Type II collagen formation is found in the NP, potentially as a self-repair mechanism; however, as the illness progresses, production of Type I collagen increases dramatically while Type II collagen synthesis diminishes. This change in collagen types in the NP and inner AF is followed by a reduction in aggrecan concentration, resulting in disc hydration and turgor pressure loss Excessive pressures on the weaker outer AF lamellae eventually result in the creation of cracks and fissures, which increases the possibility of NP material seeping into the outer AF. Furthermore, these defects in the degenerated discs outer AF enable neoinnervation and angiogenesis within the IVD [8].

10. CLINICAL FEATURES

There are many different and nonspecific clinical manifestations of Degenerative Disc Diseases (DDD). Back pain is an essential feature in the midline and paraspinous of the lumbar region. Also, sitting intolerance is considered a major feature of DDD. Other features of pain that its usually worsened with flexion and decreased with extension. DDD can occur in absence of back pain, and 30% of asymptomatic patients had disc abnormalities in MRI were reported. Discogenic pain is mainly axial but can be somatic referred pain to the lower extremities which is common too. it appears to be ill-defined,

widespread, and intolerable deep pain deep in the limb [9].

Back pain has many different red flags that should be considered such as saddle paresthesia, sudden and unexpected bladder or bowel dysfunction/ incontinence, anal sphincter unexpected laxity, severe or progressive lower limb neurological deficit. Furthermore, sleep disturbance from night pain, history of cancer, and major trauma such as fall from height or road traffic accidents. Also, Loss of tendon reflexes, Up-going plantar reflex are considered to be red flags [10].

Movement and position may exacerbate LBP such as flexion. In contrast, the extension will relieve it. Facet arthropathy may be indicated if the pain appeared with extension. So, its important to exclude other etiologies when examining patients with assumed Lumbar DDD. Some pathologies such as renal calculi, pancreatic disease, aortic aneurysms should be excluded. In addition, the doctor should ask about constitutional symptoms for other pathologies [11].

11. DIAGNOSTIC IMAGING

The clinical diagnostic procedure begins with a medical history and physical examination. Aiding the clinical finding, radiographic diagnostic modalities can be used to confirm degenerative disc disease, including plain roentgenogram (X-ray), computed tomography (CT) scan, magnetic resonance imaging (MRI), and provocative discography, or rule out other diagnoses. When a patient presents with lower back pain, it is important to correlate clinical symptoms with imaging. If symptoms are not concordant with the imaging modality, interventional treatment may not yield the benefits desired [11,12]. Two planes, upright lumbar X-ray are the first-choice imaging study. It is used to exclude other diagnoses more than diagnose DDD directly. The findings of the lumbar disc disease radiograph include a variety of indicators that can be utilized to determine DDD, especially in symptomatic patients, although further studies are indicated. Within the early stages, due to the difficulty of x-rays to view the discs and soft tissues directly, annular tears and painful discs may be identified, but there is no major evidence of Disc damage. In later stages, there are indications of a disc narrowing, combined with the development of osteophyte in the adjacent vertebral body, facet hypertrophy, and vacuum phenomenon within

the disc that help the diagnosis of DDD [12,13]. The standard imaging technique for identifying IVD diseases, MRI, is more sensitive in evaluating DDD. MRI scan findings include T2 signal loss within the NP, disc space narrowing, endplate changes, and internal disc tear or derangement signs. Two useful classifications commonly used to interpret the severity of DDD and associated problems, Pfirrmann classification for disc morphology, demonstrates the degeneration progression of the disc, while Modic classification for adjacent vertebral body alterations shows active inflammation and hematopoietic marrow fibrovascular replacement [11,13]. Diffusion-weighted imaging (DWI) can give important information on the microstructure of tissues by providing motion probing gradient (MPG) in some directions to track the random movement of water molecules that are normally limited in tissues [14]. Recently had been focused on echoplanar diffusion tensor imaging for MR tractography had enhanced image and tract fiber quality on both qualitative and quantitative metrics. These methods can be used to examine the neural adhesions and the connection between nerve fibers and DDD, especially in advanced stages of the disease [15]. In general, a CT scan is of little use in determining the proper DDD diagnosis. However, with a long term of intervertebral disc (IVD) degeneration that can lead to tissue damage, in the future, a multi-detector CT scan might be a useful assessment tool, especially for people who are unable to obtain an MRI scan for DDD evaluation. More research and categorization on multi-detector computed tomography scan assessment of DDD will be required [16]. When imaging studies such as MRI and plain radiography fails to demonstrate the pathologies necessary for a proper diagnosis in a symptomatic patient, provocative lumbar discography is a technique that can be used to elicit and recreate a patients pain. Its helpful to find DDD levels that replicate the patients pain. Identifying adjacent levels that do not reproduce their pain is extremely beneficial [13].

12. MANAGEMENT

12.1 Conservative Therapy

Before undergoing any invasive operations, a trial of conservative treatment is suggested. Physical activity concentrating on back muscular strengthening, physiotherapy, oral medicines, and vitamins are all examples of conservative treatment [12]. Running exercise was proven to repair degenerative discs and raise cell densities

in the annulus fibrosus and nucleus pulposus, according to studies [17].

Patients with symptomatic degenerative disc degeneration are typically prescribed paracetamol, nonsteroidal anti-inflammatory medicines (NSAIDs), opioids, and muscle relaxants if there are no contraindications to these medications. In addition to back education, reassurance, and self-management alternatives, these medicines are provided [12].

Pain-relieving injections work by decreasing inflammation, providing temporary anesthesia, and reduce the volume of some fluids in the region between the dura and the degenerated prolapsed disc by the adhesiolysis process [12].

12.2 Molecular Therapy

Developments in molecular science in experimental and clinical trials have led to the manipulation of genes, cells, and various growth factors in an order to produce proteins that regenerate, and repair degenerated discs in their early stage [12].

12.3 Cell-Based Therapy

Stem cells have a unique characteristic of differentiating into chondrocytes which resembles the Nucleus Pulposus cells of the disc. So, they can be used to restore the lost cells in degenerated discs. This decreases inflammation and aids in the regeneration of degenerated discs. This therapy is effective only for advanced stages [18].

12.4 Growth Factor Therapy

Growth factor therapy aims to add growth factors that stimulate anabolic functioning with upregulation of proteins in the extracellular matrix which will increase the chondrocyte cell production [19]. The clinical application of such therapies and their efficacy is not known yet [20].

12.5 Tissue Engineering Therapy

The tissue engineering method consists of combining growth factors, stem cells, and a scaffold. This approach is an effective treatment for intervertebral disc disease [21].

12.6 Gene Therapy

Researchers have recently used the idea of trans-duction of genes that can interfere with disc

degeneration or perhaps stimulate disc regeneration to DDD. This technique necessitates the discovery of important genes involved in the disc degeneration process, as well as methods of delivering those potentially curative genes to disc cells. Gene vector systems, which include a range of viral and, more recently, nonviral vectors, may do this [11]. Gene therapy has the benefit that, unlike growth factor treatment, it can have a long-term effect if the gene is successfully transferred to native target cells. The gene-altered target cells will continue to generate proteins that are beneficial to the intervertebral discs maintenance and healing [12]. Approximately 40% of adenovirus and retroviral vectors have been utilized in clinical studies so far. However, because of the many side effects and dangers associated with viral vectors, research on non-viral vectors that can replace viral vectors is also underway [22].

12.7 Reconstructive strategies: Percutaneous Intervertebral Disc Techniques

This technique is minimally invasive and helps in relieving radicular pain by reducing the volume of the nucleus using mechanical, thermal, or chemical sources for a patient who didn't get help from medical therapy [1]. This technique aims to separate the normal neural elements from irritant pathological elements, reduction of the size of the disc protrusion in the spinal canal, and make damaged IVD function again [12].

12.8 Mechanical decompression

This technique work by rub disc material anterior to herniation using image-guidance to the pathological area, by minimizing the size of disc material, through indirect decompression of the spinal canal. After the assessment and evaluation of minimally invasive spine surgery and endoscopy, it shows that there is a shift of a non-visualized indirect reduction of disc material through fluoroscopy to the endoscopic treatment of the disc with endoscopic visualization to safely and effectively execute the disc excision removal and treatment of the painful area [12]. Successful results reach up to 75% in discogenic and radicular pain [1].

12.9 Thermal decompression

This technique work by putting a thermal catheter in the posterior annulus by an introducer needle

connected to a generator, after that heated to 90°C for 17 minutes, which lead to thermocoagulation of nociceptors nerve fibers. This technique is effective in only selective cases of radicular pain, with an 81% of success rate and 2% adverse event [1].

12.10 Chemical decompression

Chemodiscolysis with ethanol leads to degradation of glycosaminoglycans and proteoglycans and losing their water-preserving capacity, causing dehydration and chemical decompression of the degenerated disc. Moreover, it could be done with oxygen-ozone which is a chemodiscolysis that can reduce inflammation and causing rapid pain relief. The ozone has a direct action on the nucleus pulposus leading to the rupture of water molecules and shrinkage of the disc that is exerting compression on the nerve roots [1].

12.11 Biomaterial Decompression

This technique relying on synthetic materials or composite implants, that don't affect the biological components of the IVD, this technique is not widely used because of the complexity of procedural usage or undesirable outcomes [23]. This technique has many advantages in biomaterial implantation: 1-stability in transport and storage, 2- Ease of obtaining and manufacturing the biomaterial as compared to molecular techniques; 3- extensive laboratory testing can be done to find a matching compatible material; 4- potential promotion of endogenous fixation of the disc architecture by providing a reconstructed scaffold for native or nurtured mesenchymal stem cells to home in, proliferate, and differentiate into suitable cells for repair and restoration of the IVD; and (5) most of the designs of these scaffolds can be introduced with a clinical needle and this help in making the perioperative risk of implantation lower than an invasive surgical procedure. This technique is a new field for research interest. This technique can be done in nucleus pulposus, annulus fibrosus, or total disc transplantation (annulus fibrosus–nucleus pulposus combination) [12]. While Biomaterial implants are still in early development, bioengineering-based strategies employing novel biomaterials showing promising results in the clinical treatment of intervertebral disc disorders [23].

12.12 Definitive Treatment: Surgical Management

Several options exist for surgically addressing a symptomatic disk, including two broad categories of surgical options: fusion and arthroplasty. Fusion could be accomplished by many different approaches. Both fusion and arthroplasty have been demonstrated to improve outcome measures and are increasingly being considered as acceptable options for intractable disk pain. Some evidence suggests that arthroplasty may offer better outcomes when compared with the currently preferred option of fusion and may potentially avoid adjacent-level degeneration [24]. Its indicated to refer the patient for a spine surgeon when the patient reports red flags that were previously mentioned, or back pain continues for 6 months even after conservative options, or when radicular or leg pain persists more than 3 months [10].

13. FUSION SURGERY

13.1 Lumbar Interbody Fusion

Lumbar fusion is one of the most performed surgeries for degenerative disease of the lumbar spine despite its controversial safety and efficacy for chronic LBP that associated with DDD. A meta-analysis found that fusion surgery was not better than conservative options in terms of the pain and functional outcomes either at short- or long-term follow-ups. Surgeons need to assess the risk of complications associated with fusion surgeries compared to additional surgeries that may be indicated after nonoperative treatment fails. Complications in the short-term may vary between thromboembolism, neurological deficit, infections, and durotomy. Late complications could be a failure of implant, adjacent-segment degeneration, nonunion, and pseudarthrosis [25]. The main objective of LIF is to restore the intervertebral space and stabilize the segments with proper height and lordosis. The best approach should be selected based on the familiarity of the surgeon with available options, each individuals pathology, and the anatomy of the patient [26]

14. TRADITIONAL OPEN APPROACHES

14.1 Posterior LIF

This is a familiar and traditional approach for many spine surgeons. indications include DDD,

instability of lumbar segment, pseudarthrosis, degenerative scoliosis, spondylolisthesis, and recurrent disc herniation. Contraindications are severe epidural, arachnoiditis, severe osteoporosis, and active infections [26].

14.2 Transforaminal LIF

This approach allows for 360 degrees of fusion and safely conducted in the upper lumbar levels. Compared to PLIF it offers better biomechanical stability and less damage to the posterior ligamentous complex. Indications and contraindications are similar to those for posterior LIF. In addition to a relative contraindication which is nerve root anomaly [26].

14.3 Anterior LIF

A less traumatic approach with a shorter hospital stay and less post-operative pain. It provides significant biomechanical stability due to the ability to use large interbody grafts. It has a risk of developing thromboembolism, ureter injury, and retrograde ejaculation in 45% of men. Indications vary between DDD, failed posterior fusion, or postoperative spondylodiscitis. Contraindications are a history of abdominal surgery, morbid obesity, prior radiation therapy, and severe atherosclerosis of the aorta [26].

15. MINIMAL INVASIVE SURGERIES

Lately, these techniques became popular because of their favorable results which minimize muscle injury and loss of blood, less operative time, and a faster postoperative recovery than the traditional open techniques. Consequently, they are more suitable for comorbid and elderly patients who are at more risk of post-operative morbidity with traditional open approaches. Lateral and obliques minimal invasive approaches offer an indirect decompression of the degenerated disc [26].

Endoscopic LIF procedures have less post-operative pain and shorter hospital stay than other MIS. The acceptable indication could be elderly patients, who are unable to tolerate open traditional surgery due to its high risk of complications [26].

16. ADJACENT SEGMENT DISEASE

Adjacent segment disease (ASD) is a spinal issue that might follow spinal fusion either

instrumentation or bone graft. Although ASD is broadly known to be an expected consequence of spinal fusion, it can happen by normal degenerative changes that happen in the spine because of aging [27].

It is considered an expected consequence of spinal fusion since when at least one movable fragment in the spine is fused and does not move anymore, the movable portions above and underneath the spinal fusion compensate for lost movement at the fusion level(s). The stress increase as the adjacent segments mobility increase which accelerates the process of tear and results in ASD [27]. A few risk factors might lead to ASD following the use of instrumentation: length of fusion (particularly at least three levels), preoperative sagittal malalignment, facet joint injury/tropism, old age, overweight and obesity, and preoperative documentation of cephalad degenerative illness (e.g., disc disorders, stenosis) [28].

ASD in the lumbar spine can be treated through a reversion posterior approach or minimally invasive techniques. The benefits of minimally invasive techniques might be generally valued in more established patients with comorbidities that preclude bigger, open procedures [29]. However, Indirect decompression and restoration of disc height through lateral interbody fusion technique results show it is safe and successful with a low morbidity rate [30].

17. BONE GRAFT AND CAGE MATERIAL

There are numerous decisions of bone grafts used in lumbar spinal arthrodesis. The gold standard in producing successful lumbar spinal arthrodesis is Iliac crest harvest [31]. However, it is additionally associated with numerous donor site comorbidities. Different alternatives are listed in Table 1. The decision of bone graft rely upon many components as patient complications identified with autograft harvest at different sites, the condition of the graft bed and nearby tissues, patient biological status, primary or correction status, mechanical climate, supplemental fixation, comorbidities and propensities, cost of the graft, and patient assumptions for the surgical result. The main objective while picking a graft is to accomplish an effective fusion [32].

The most usually utilized interbody cages are the Titanium and polyether ether ketone (PEEK). While titanium confines give quick stability and endure critical compressive powers, PEEK

confines have the advantage of a modulus of flexibility similar to cortical bone [33]. Although, there are no distinctions from those operated with recently developed TT cages regarding segmental stability it showed an alternate technique of bone ingrowth and attachment [34].

18. TOTAL DISC REPLACEMENT

The main issue of fusion is the disturbance of the biomechanics of the remainder of the spine, which may result in adjacent disc disease. This might be prevented by doing movement-preserving surgeries such as total disc replacement, also known as lumbar disc arthroplasty [10].

The idea of LTDR is to decrease the aggravation of pain at the vertebral segment by replacing a deteriorated IVD with a moveable prosthesis, which will emulate the Range of movement (ROM) of the local intervertebral plate (IVD) and consequently ideally reestablish its anatomical structures and biomechanics [35].

The primary candidates for LTDR are those with DDD that are not responsive to conservative treatment for half a year with age limitation somewhere in the range of 18 and 60 years of age is generally announced for males and females. other consideration models, for example, post-laminectomy condition or earlier

lumbar microdiscectomy, back pain with or without leg pain but without radiculopathy, and just 1-or 2-level DDD [35].

Contraindications are patients presenting with any spinal deformity. Other contraindications are facet joint arthrosis, spinal stenosis, osteoporosis, osteopenia, a straight leg raise creating pain underneath the knee, hypersensitivity to embed materials, and evidence of nerve root compression. Patients who have recently encountered a lumbar fusion or fractures are not encouraged to go through LTDR, as are patients who have 3-or more elevated level DDD [35].

19. HYBRID PROCEDURE

The hybrid procedure is a surgical method for two-level disc disease in the lumbar spine (Anterior combination ALIF at one level and Total Disk Arthroplasty TDA at contiguous). Hybrid fusion attempts to address two-level DDD by joining the pros of a solitary level ALIF with those of a single level disc arthroplasty [36]. A hybrid medical procedure gives steadiness at an unstable deteriorated lumbar fragment while still keeping the movement at the adjacent level. Either in the statistical or clinical aspects, the advantages can be accomplished with the hybrid procedure, with results kept up with for somewhere around 8 years postoperatively [37].

Table 1. Summary of relative benefits and disadvantages of each type of grafting option

Graft type	Advantages	Disadvantages
iliac crest	Large availability, low cost, growth factors, live cells	Donor-site morbidity, increased blood loss, increased operative time
Local bone	Low cost, growth factors, live cells	Limited availability
Bone marrow aspirate	Live cells, growth factors	Needs carrier
Fresh-frozen allograft	Large availability, low cost, growth factors	Disease transmission, inflammation, no live cells
Fresh-dried allograft	Large availability, low cost	Brittle, no growth factors, no live cells
Demineralized bone matrix	Large availability, low cost	Amorphous, few growth factors, no mineral portion
rhBMP	Large availability, potent growth factors	Requires carrier, no live cells, expensive
Ceramics (β -TCP and CHA)	Large availability, structural sound, low immunogenicity	No live cells, no growth factors, no organic matrix

Source [32]

20. CONCLUSION

IVD degeneration is attributed to a complex interplay between environmental and genetic factors. DDD is a process that includes a progressive decrease in disk nutrient supply and changes in extracellular matrix (ECM) composition, which weakens the tissue strength and alters the cell metabolism. Diagnosis of DDD is done by various methods, computed tomography (CT) scan, magnetic resonance imaging (MRI), and provocative discography. These methods should be used in conjunction with the patient history, physical examination and specific biomarker to monitor the response to treatment. There are three major lines of treatment; Treatment Options for Relief of Pain in Conservative Therapy. Treatment with aims of Restoration, Repair, and Regeneration of Intervertebral Disc Diseases: Molecular Therapy. Reconstructive Strategies: Percutaneous Intervertebral Disc Techniques. Definitive Treatment for Intervertebral Disc Diseases: (surgical management).

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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