ADJACENT SEGMENT DISEASE IN DEGENERATIVE PATHOLOGIES WITH POSTERIOR INSTRUMENTATION

DOENÇA DE SEGMENTO ADJACENTE EM PATOLOGIAS DEGENERATIVAS COM INSTRUMENTAÇÃO POSTERIOR

ENFERMEDAD DE SEGMENTO ADYACENTE EN PATOLOGÍAS DEGENERATIVAS CON INSTRUMENTACIÓN POSTERIOR

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ABSTRACT

Objective: To establish the real incidence of adjacent segment disease after fusion, and to identify the levels and predisposing factors for the pathology, as well as the functional results. Methods: a retrospective case series study with level of evidence IIB, in a sample of 179 patients diagnosed with stenosis of the lumbar spine, spondylolisthesis and degenerative scoliosis, submitted to surgery in the period 2005 to December 2013, with posterior instrumentation and posterolateral fusion, with follow-up from 2007 until May 2014, in which the symptomology and radiographic findings were evaluated, to establish the diagnosis and treatment. Results: the study included 179 patients diagnosed with stenosis of the lumbar spine (n=116), isthmic and degenerative spondylolisthesis (n=50) and degenerative scoliosis (n=13); during the study, 20 cases of adjacent level segment were identified, 80% of which were treated surgically with extension of the instrumentation, while 20% were treated conservatively with NSAIDs and therapeutic blocks. Conclusion: An incidence of 11% was found, with an average of 3.25 years in diagnosis and treatment, a prevalence of females and diagnosis of stenosis of the lumbar canal on posterior instrumentation, a predominance of levels L4-L5; 80% were treated with extension of the instrumentation. The complications were persistent radiculopathy, infection of the surgical wound, and one death due to causes not related to the lumbar pathology.

Keywords: Spinal diseases; Spinal fusion; Arthrodesis.

RESUMO

Objetivo: Estabelecer a incidência real da doença do segmento adjacente após fusão e identificação dos níveis e fatores predisponentes à patologia, assim como os resultados funcionais. Métodos: Estudo retrospectivo de série de casos, com nível de evidência IIB, em amostra de 179 pacientes com diagnósticos de estenose de canal lombar, espondilolistese e escoliose degenerativa, submetidos a cirurgia no período de 2005 a dezembro de 2013, com instrumentação posterior e fusão posterolateral, com acompanhamento de 2007 até maio de 2014, no qual se avaliaram a sintomatologia e os achados radiográficos para estabelecer o diagnóstico e tratamento. Resultados: O estudo incluiu 179 pacientes com diagnóstico de estenose de canal lombar (n=116), espondilolistese ístmica e degenerativa (n=50) e escoliose degenerativa (n=13); durante o estudo foram identificados 20 casos de segmento de nível adjacente, sendo que 80% foram tratados cirurgicamente com extensão da instrumentação, enquanto 20% foram tratados de modo conservador com AINE e bloqueios terapêuticos. Conclusão: Verificou-se uma incidência de 11%, com média de 3,25 anos no diagnóstico e tratamento, maior prevalência do sexo feminino e diagnóstico de estenose de canal lombar à instrumentação posterior, com predomínio dos níveis L4-L5; 80% foram tratados com extensão da instrumentação. As complicações foram radiculopatia persistente, infecção da ferida cirúrgica e um óbito decorrente de causas não relacionadas com a patologia lombar.

Descritores: Doenças da coluna vertebral; Fusão vertebral; Artrodese.

RESUMEN

Objetivo: Establecer la incidencia real de la enfermedad de segmento adyacente tras la fusión e identificación de los niveles y factores predisponentes a esta patología, así como los resultados funcionales. Métodos: Se realizó un estudio retrospectivo de serie de casos, con nivel de evidencia IIB, con una muestra de 179 pacientes con diagnósticos de canal lumbar estrecho, espondilolistesis y escoliosis degenerativa, intervenidos quirúrgicamente en el periodo de 2005 a diciembre del 2013, con instrumentación posterior y fusión posterolateral, bajo seguimiento desde 2007 hasta mayo de 2014 en el cual se evaluó la sintomatología y hallazgos radiográficos para establecer el diagnóstico y manejo. Resultados: Se incluyeron en el estudio 179 pacientes con diagnóstico de canal lumbar estrecho (n=116), espondilolistesis ístmica y degenerativa (n=50), escoliosis degenerativa (n=13); durante el estudio se identificaron 20 casos de segmento de nivel adyacente, siendo que el 80% se trataron de manera quirúrgica con extensión de la instrumentación, mientras que el 20% se manejaron de modo conservador con AINE y bloqueos terapéuticos. Conclusión: Se identificó una incidencia del 11%, con un promedio de 3.25 años en el diagnóstico y tratamiento, mayor prevalencia del sexo femenino y diagnóstico de canal lumbar estrecho en instrumentación posterior con predominio en los niveles L4-L5; el 80% se trataron con extensión de la instrumentación. Las complicaciones fueron radiculopatía persistente, infección de la herida quirúrgica y un fallecimiento debido a causas no relacionadas con la patología lumbar.

Descriptores: Enfermedades de la columna vertebral; Fusión vertebral; Artrodesis.

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INTRODUCTION

Surgical treatment of multiple pathologies that cause lumbar and radicular pain has been linked, in recent years, to an increased incidence of adjacent segment disease or transitional syndrome;[1] characterized by a rapid degeneration, whether preexisting or iatrogenic, of the adjacent level following spine surgery, associated with clinical symptoms characterized by low back pain and radiculopathy.[2]

After posterior instrumentation of the lumbar spine, biomechanical changes occur, which are characterized by increased load associated with instability of the segment. These changes are evaluated by imaging studies of degenerative changes that have been termed Adjacent Segment degeneration, with an incidence of 8 out of 100 cases.[2] In order to be able to diagnose adjacent segment disease, the radiographic findings must be correlated with the presence of symptoms of low back pain and radiculopathy, similar to those before the procedure or new episodes, for at least 6 months after the surgical procedure, being one of the main causes of late-onset lumbar surgery failure.[1]

It has an incidence of 3% a year,[3] with a re-intervention rate of 16% at 5 years and 36.1% at 10 years, and an interval between initial and revision surgery of 5.2 to 7.1 years.[2]

Risk factors include the patient's age (with a higher incidence in patients over 55 years of age), sex, bone quality, predisposing factors (including degenerative disc states, stability of the segment, and arthritis), and the type of procedure performed; laminectomy, facetectomy, or posterior transpedicular instrumentation with iatrogenic lesion of the joint capsule, which has a higher incidence in the cases of degenerative spondylolisthesis,[4] particularly in level L4/L5,[2] with a higher incidence in presentation of caudal levels in the lumbar spine, in the cephalic segment of the cervical spine and in 360 fusions with PLIF.[5]

The main radiographic findings were: disc degeneration, facet joint arthritis, retro/anterolisthesis, instability (classified as displacement of more than 4mm in the anteroposterior plane, 10° in the sagittal plane more common in intervertebral disc hernias, 5° rotation between the vertebral platforms,[3] stenosis of the canal, intervertebral disc hernia, facet joint arthrosis, compression fractures, posterior osteophytes and degenerative scoliosis.[6]

The treatment is based on revision surgery with posterior or 360° instrumentation (Posterior Lumbar Interbody Fusion, PLIF techniques/Anterior lumbar interbody fusion, ALIF, as it has shown a lower incidence of adjacent segment degeneration)[7] with cephalic or caudal extension, depending on the level affected. Preventative measures range from traspedicular fixation of the adjacent segments in the initial surgery to fixation of L5/S1 in listhesis of L4/L5, due to its high incidence of adjacent segment degeneration, the implementation of interspinous devices, dynamic fixation, and total disk arthroplasty.[8]

The purpose of our study is to establish the actual incidence of adjacent disk disease, due to the wide variation of incidence described in the literature, as well as the risk factors and levels of fusion, the most common presentations, and the evolution of our patients, with the aim of preventing this pathology and offering the best treatment for the resolution and functional improvement of the patient.

METHOD

A retrospective study was conducted of a case series, with IIB evidence, with a sample of 225 patients operated on at the Hospital ISSSTE Regional de Monterrey; of this number only 179 were included, with diagnoses of: spondylolisthesis (50 patients), stenosis of the lumbar canal (116 patients), and degenerative scoliosis (13 patients), and who underwent surgery in the period January 2005 to December 2013, with posterior transpedicular instrumentation, 360° and posterolateral fusion, who were in follow-up in the period January 2007 to May 2014 in the outpatient clinic where the pain was clinically evaluated by the Visual Analog Scale (VAS) and the radiographic findings with plain and dynamic R-rays, taking as reference the stability criteria of White and Panjabi, and nuclear magnetic resonance imaging (MRI), based on the MODIC scale of disc degeneration and the presence of canal stenosis and facet arthrosis.

The main symptom found was the persistence of radicular pain without relief with conservative treatment. A total of 20 patients were diagnosed with adjacent level disease in the above-mentioned period. They resented radiculopathy, as well as decreased function, mainly due to neurogenic claudication. The severity of symptoms was evaluated by the VAS scale on each visit, as well as plain and dynamic radiographs in which the presence of listhesis was observed in the majority of cases, with electromyography and MRI of the lumbar spine being requested on a subsequent visit.

After establishing the diagnosis of adjacent segment disease, surgical treatment was carried out, based on the extension of the posterior instrumentation in 80% of the patients, with 20% being treated conservatively with non-steroidal analgesics, neuromodulators and epidural and foraminal therapeutic neuromodulators and blocks, due to the patient's reluctance to undergo re-intervention, or as palliative treatment while awaiting revision surgery.

RESULTS

Twenty patients with adjacent segment disease were identified during the course of the study. (Figure 1) With an incidence of 11%, with average presentation and surgical treatment of 3.25 years, the shortest period being one year, and the longest period 7 years, with higher incidence in females (Figure 2), an average age of 60 years, and higher incidence in the 5th decade of life. (Figure 3)

The diagnoses that were most closely correlated was lumbar canal stenosis, with 65%, spondylolisthesis with higher prevalence in the degenerative presentation, with 30% and degenerative scoliosis, with 5%. (Figure 4)

The level of involvement was greater in L4/L5, and the procedure most closely correlated with the prevalence of adjacent level disease was posterior transpedicular instrumentation of L4/L5; fusion 360° with PLIF techniques was performed in only one patient, in which the extension of the instrumentation was one cephalic level. (Figure 5)

Eighty percent of the patients diagnosed with adjacent segment disease were treated surgically with extension of the instrumentation, with no significant differences between the distal and proximal levels. (Figure 6)

Twenty percent were treated conservatively with epidural and foraminal therapeutic blocks; one patient died due to causes not related to the intervention, and another received palliative blocks while awaiting surgery.

In relation to the radiographic findings, the main one found was spondylolisthesis, in simple and dynamic radiographies, followed by facet joint osteoarthritis and disc degeneration, evaluated by MRI. (Figures 7-10)

In the symptomatic evolution, the main symptom reported was persistent radiculopathy without adequate response to conservative treatment, with a mean VAS of 7 prior to the revision surgery.

After extension of the instrumentation, 80% had adequate symptomatic and functional evolution.

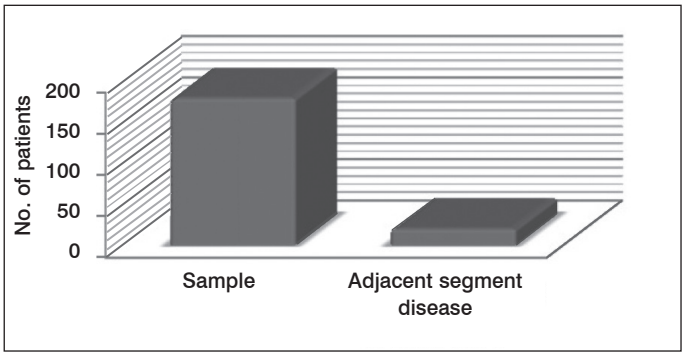


Figure 1. Study sample.

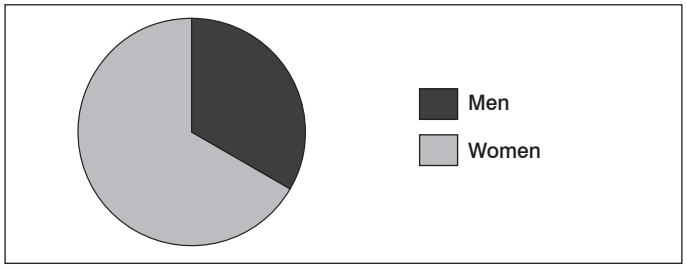


Figure 2. Incidence of men/women.

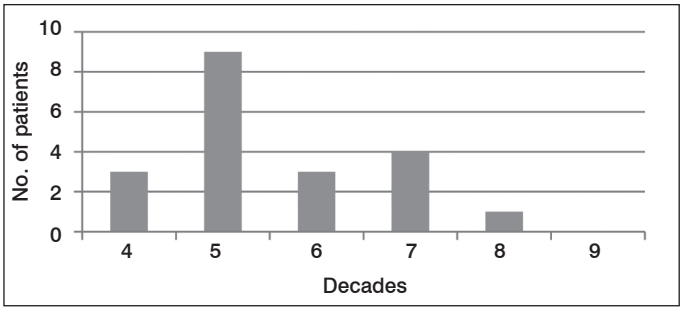


Figure 3. Age at presentation.

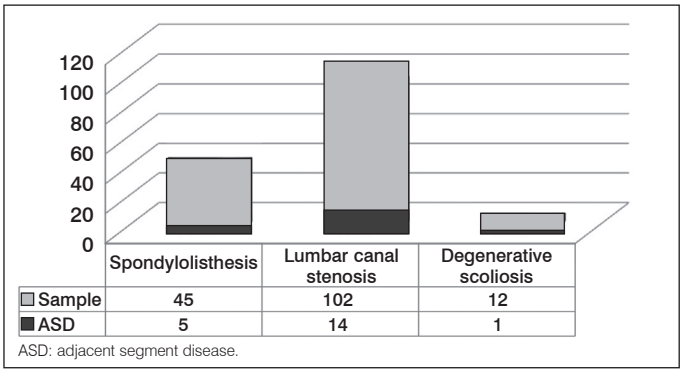


Figure 4. Total no. of cases in degenerative pathologies.

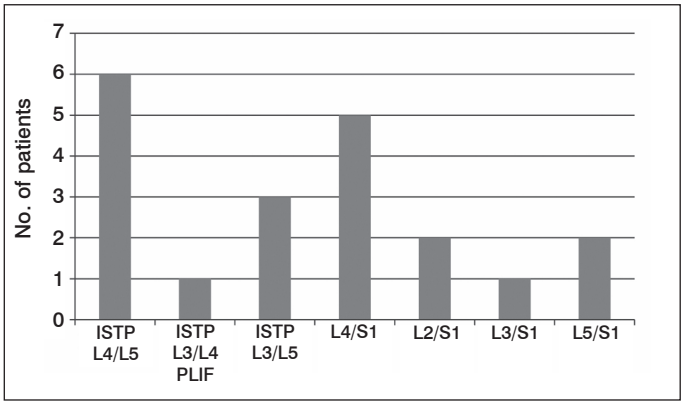


Figure 5. Levels of Instrumentation.

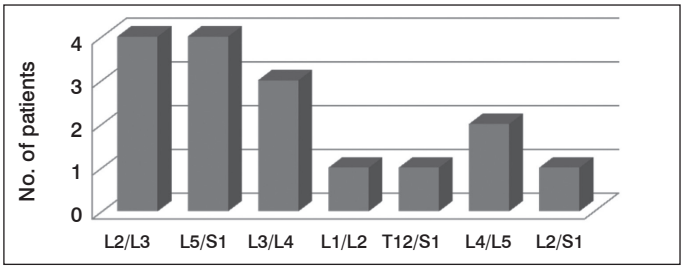
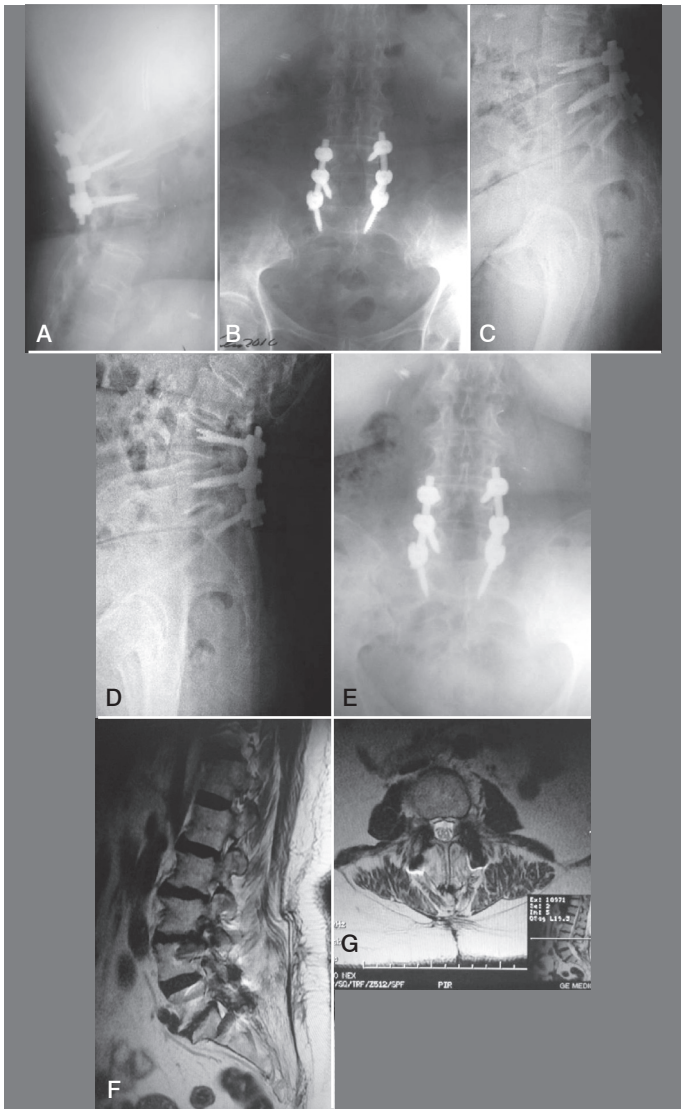


Figure 6. Levels of extension of the instrumentation in revision surgery.



Figures 7. A and B) Female patient aged 84 years, diagnosed with stenosis of the lumbar canal, postoperated in 2010 with transpedicular instrumentation (ISTP) L4/S1 and laminectomy L4/L5, persistent radicular pain with diagnosis of adjacent segment disease in 2014, degenerative changes and instability present in 2010; C, D, E, F and G) 2014: assessed with instability and displacement of more than 4 mm in dynamic projections, while the MRI showed listhesis and disc arthritis observed in sagittal plans, and disc degeneration and facet arthritis in the axial projection.

DISCUSSION

The highest prevalence of adjacent segment disease occurred in women, with a higher incidence in the 5th decade of life, and in patients with a history of lumbar canal stenosis (65%), with an incidence of 11% in the study period. The average time from diagnosis and treatment was 3.25 years, therefore it is necessary to identify the degenerative pathologies of the adjacent level during the initial surgery, to prevent progression to adjacent segment disease, whether through the inclusion of cephalic and caudal levels in the primary instrumentation, or through the implementation of dynamic stabilizers to preserve mobility and prevent progression of the degeneration, these findings being correlated with the literature in the main level affected, L4/L5, the value includes the level of L5/S1 in the primary intervention may be a suitable alternative for preventing the progression of the adjacent segment disease.

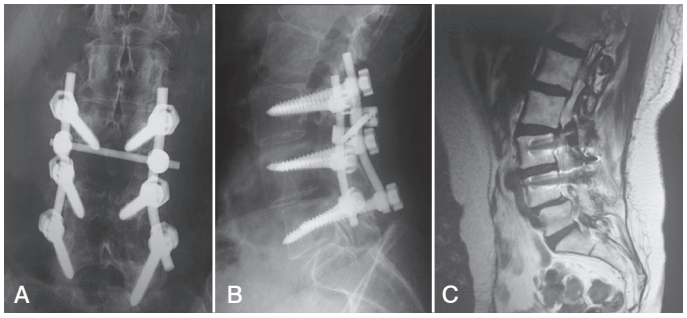


Figure 8. Female patient with history of posterior instrumentation and laminectomy in 2010 with clinical symptoms of radiculopathy on the left side.

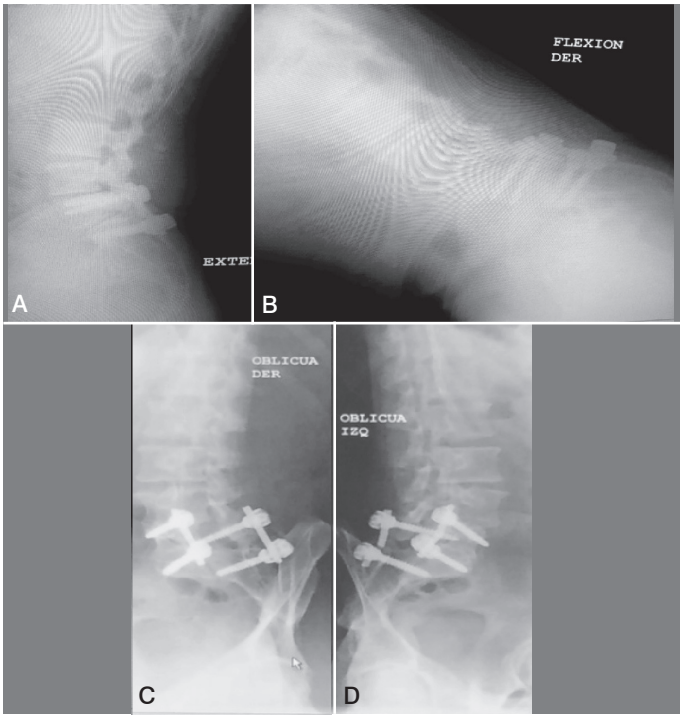


Figure 9. Male patient postoperated with spondylolisthesis which continued after the procedure in 2012 with lumbar pain. Displacement is observed in the dynamic projections.

The presence of adjacent segment disease in instrumentations that include S1 with symptoms of sacroiliitis was found in the literature, as this joint receives an increase in load transmission, therefore this pathology should be considered in patients with a history of long instrumentation and symptoms of sacroiliitis.

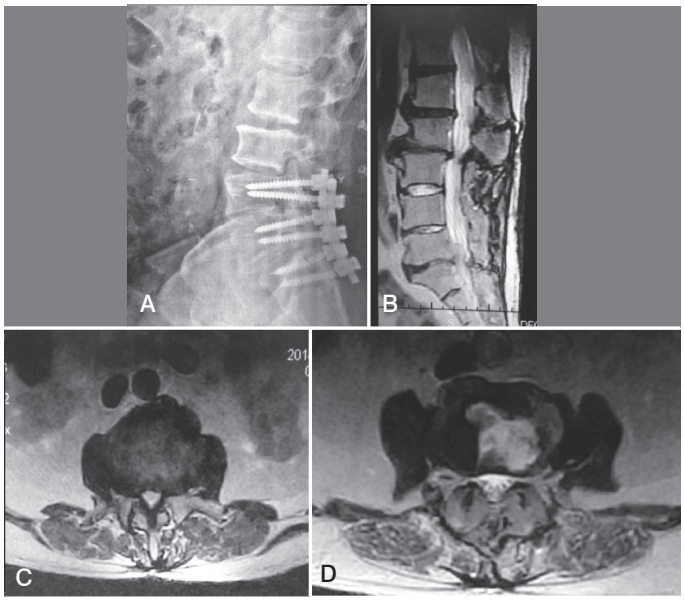


Figure 10. Male patient in the 6th decade of life with persistent radicular pain, treated with posterior instrumentation in 2010 with removal of material due to infection in 2011 and diagnosed with adjacent segment disease in 2014.

CONCLUSIONS

The adequate study of the patient referred to spinal surgery, as well as the treatment plan, are important factors for preventing failure of the lumbar surgery, with late-onset symptoms of low back pain and radiculopathy following the procedure, as this presents an incidence of 11% of all instrumentations in degenerative pathologies, its presentation ranging from 1 to 7 years.

The major clinical findings are radicular pain that is resistant to treatment, and radiographic alterations characterized by spondylolisthesis, facet joint arthrosis and intervertebral disc herniation.

The established treatment with the best symptomatic clinical outcome is extension of the instrumentation.

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All authors declare no potential conflict of interest concerning this article.

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