Factors influencing the evaluation and management outcomes of coccygodynia: A literature review

Article *in* Journal of Back and Musculoskeletal Rehabilitation · May 2013

DOI: 10.3233/BMR-2012-00355 · Source: PubMed

3 authors, including:

Anoop Aggarwal
Pt. Deendayal Upadhyaya Institute for the Physically Handicapped
12 PUBLICATIONS **58** CITATIONS
SEE PROFILE

Suraj Kumar
U.P. Rural Institute of Medical Sciences & Research
71 PUBLICATIONS **247** CITATIONS
SEE PROFILE

Journal of Back and Musculoskeletal Rehabilitation 26 (2013) 105–115
DOI 10.3233/BMR-2012-00355
IOS Press

Review Article

Factors influencing the evaluation and management outcomes of coccygodynia: A literature review

Anoop Aggarwal[a,*], Suraj Kumar[a] and Dharmendra Kumar[b]
[a]*Department of Physiotherapy, Pt. DDU IPH, New Delhi, India*
[b]*Pt.DDUIPH, New Delhi, India*

Abstract.
BACKGROUND: This paper reviews various methods for the assessment and management of the coccygodynia. It included review of both conservative as well as operative methods. Goal of conservative methods in coccygodynia is to restore the functional status of the patients and to eliminate or at least minimize the discomfort associated with this disabling condition. Though various conservative methods have been used traditionally, yet not all patients respond positively to them. In such cases operative interventions are used, yet previous literature does suggest that even this method is not absolutely promising as not all patients do respond positively to it.
METHODOLOGY: The purpose of this article is to review various literatures available for the assessment and the management of coccygodynia. It tends to identify the factors which could guide the selection of best intervention strategy for its management. English literature databases were searched to find the studies matching the predetermined inclusion criteria.
CONCLUSION: Multiple factors (pathology, duration of pain, Body mass index, neurotic personality, associated disc pathologies, amount of inter-coccygeal movement) influence the outcomes of the remedial interventions. This study highlights multiple treatment approaches for the rehabilitation of the coccygodynia management.

Keywords: Coccyx, coccygodynia, manual therapy, coccygectomy

1. Introduction

Pain in or around the coccyx region is one of the cause of most disabling pain known as coccygodynia. Coccygodynia is defined as the pain in or around the coccyx with the triggering or worsening of pain while sitting or sitting to standing position [19,21]. This condition accounts for less than 1% of all back pain conditions reported to physicians. The chronic disabling nature of the condition and the associated painful discomfort makes the condition easily noticeable however due to unavailability of the standard protocols and wide variation in the treatment approach in the different areas of expertise (physiotherapy, orthopedics, neurology, urology) this problem is still treated on hit and trial basis.

Coccygodynia is about five times more frequent in women [13] because the female pelvis is anatomically more prominent at the sacral and coccygeal level; at lower position and more posterior in pelvis [25] thus exposed to trauma during child- birth [15].

Coccydynia is typically worse when the patient is sitting (due to pressure on tip of coccyx). This pain further aggravates when the subject leans slightly backward (increased weight bearing via tip) and decreases

*Corresponding author: Anoop Aggarwal, Master in Physiotherapy (Sports Medicine), Department of Physiotherapy, Pt. DDU IPH, New Delhi-110002, India. Tel.: +91 9911 261 730; E-mail: anoop_bpt@yahoo.com.

ISSN 1053-8127/13/$27.50

when they lean forward (because this shifts more of the weight to the bilateral ischium rather than the coccyx) or lean toward side to side [31].

1.1. Anatomy of coccyx

Coccyx, the tailbone, is the terminal segment of the human vertebral column and it comprises of three to five vertebrae below the sacrum, it is attached to the sacrum by sacrococcygeal joint which is a fibrocartilagenous joint, and permits small amount of movement between the sacrum and the coccyx [11,26,40]. Though coccyx is the remnant of a vestigial tail, but this is not entirely useless; it is an important attachment for various muscles, tendons and ligaments. These muscles (Levator ani muscle; external sphinchter muscle; coccygeus muscle), and the ligaments are important for providing support and the optimal mechanism for working of pelvic floor [41]. Additionally, it is also part of the weight-bearing structure along with ischial tuberosities and inferior *rami of ischium*, which acts as a support for a person while sitting. When a person sits leaning forward, the ischial tuberosities and inferior rami of the *ischium* take most of the weight, but as the sitting person leans backward, more weight is transferred to the coccyx. Coccyx [19] may consist of up to five separate bony segments, the most common configuration being two or three segments.

1.1.1. Muscles attaching to coccyx

Muscles inserting on the anterior coccyx include the levator ani (it is divided into two muscle fascicles known as pubococcygeal and iliococcygeal). These structures form a muscular diaphragm that supports the visceral pelvis and opposes displacement of the latter associated with increases in intra-abdominal pressure (preventing inferior sagging of the intrapelvic contents) [31]. Various pelvic content that are supported by these muscular layers include reproductive organs, urinary bladder, distal colon, terminal rectum, pelvic arteries, pelvic veins, pudendal nerves [40].

The muscle called as 'Coccygeal muscle' is located posterosuperiorly and it supports the coccyx during straining at defecation and in delivery. Muscles originating on the posterior coccyx include the gluteus maximus which functions to extend the thigh during ambulation. The contribution of this muscle to Coccygeal motion has produced one specific pain pattern, related with the most medial and inferior muscle fibers lying close to the coccyx and producing pressure sensation in the coccyx area when the patients are sitting. Differential diagnosis of this condition must be done because the prescription of rubber ring to relieve the coccygodynia can aggravate the pain if it concentrates pressure on the activating point present in the affected muscle.

1.2. Causes of coccygodynia

The term 'coccygodynia' describes a pattern of symptoms, which represents a collection of conditions which can have different causes and need different treatments. A large number of conditions may lead to coccygodynia.

A study [18] reported a significant correlation between the body-mass index and the incidence of coccygodynia. Postacchini and Massobrio [11] classified four clinically encountered configuration of coccyx on basis of AP and lateral view. Type I coccyx is slightly curved forward. Type II has a more marked curve and points forward. Type III is characterized by a sharp forward angulation, and type IV by subluxation of the sacrococcygeal or intercoccygeal joint [18,33]. Type II, III or IV are more prone to become painful than type I [11].

Trauma factors include direct blow to the coccyx, a fall on tip of the tailbone in the seated position on a hard surface, fracture or bruise of coccyx [11], repetitive straining or friction against the coccyx (as happens in bicycling or rowing) can result in an injury or partial dislocation of the sacrococcygeal junction; inflammation of the Sacrococcygeal joint like during sacroilitis; sacrococcygeal ligament sprain; coccyx may fracture during childbirth; *hormonal factors* play important role at the end of the third trimester, relaxin hormone increases the mobility of the cartilaginous joint between the sacrum and the coccyx which augments movement of coccyx to stretch and permanent change the resting tension of the ligaments and muscles that surround and attach to the coccyx [2].

This pain may also result as a *Referred pain* from other sources like lumbar spine facet joints and muscles; muscle spasm or tightness in the pelvic floor muscles; trigger point in gluteus maximus, Piriformis or adductor Magnus muscles; sprain of Sacrospinous/Sacrotuberous Ligaments. This pain is often distinguished as is eases when sitting rather than getting worse.

Organic pathology like tumors involving sacrum or coccyx; Referred pain from lower rectal and anal tumors. Chordoma, giant cell tumours, intraductal schwannoma, perineural cysts [1], intraosseous lipomas or pericoccygeal glomus bodies [36]. If there is

a history of altered bowel function or rectal bleeding, then this cause should be excluded before proceeding to any other treatments.

1.3. Idiopathic coccydynia

Less common causes of coccyx discomfort include bone spurs, compression of nerve roots, pudendal neuropathy, previous medical procedures, deposits of calcium in joints or injuries to other parts of the spine, local infections, anal intercourse or meningeal cyst. Tailbone pain may begin after certain medical procedures, such as colonoscopy.

2. Purpose

The purpose of this study is to look in to various evidences available for the assessment and management of coccygodynia and to improve the understanding of rationales behind these approaches. This study also highlights the management approaches for the management of coccygodynia as per the previously available literature.

3. Method

3.1. Search strategy

Authors independently searched the available English-language literatures from the Sciencedirect, Pubmed, PEDro, OVID databases. Both RCTs and reviews were collected from the primary search and their related articles. Various keywords (5 keywords) which were used for this search included – *coccyx, coccygodynia, manual therapy, coccygectomy, levator ani massag*. There was no restriction in terms of the year of the publication. Initial search hit about 203 articles. Out of these only those articles were considered which were published in English language; contained at least one of the searched keyword in its title and focused on the treatment and diagnosis of coccygodynia. 8 articles were found which met these inclusion criteria. Manual searches of relevant review bibliographies and reference lists of primary studies were undertaken to look for possible studies not captured by the electronic search.

3.2. Conservative procedures

Conservative treatment are first line of treatment and consist of anti-inflammatory medication, digital manipulation, and alteration in sitting position, postural advice, local steroid injections, hot sitting baths.

3.2.1. Manual methods

When coccygodynia persists for more than two months then it is considered to be a chronic condition [15,19,21]. In such cases manual treatments are preferred conservative approaches which involve manually working on tight, painful muscular structures and are believed to improve the mobility of coccyx segments and reduce the spasm of surrounding muscles. These methods include repeated coccyx manipulation and levator ani massage [17].

3.2.1.1. Muscle energy technique (MET)

If patients present with higher pain in standing position and the lesser pain while sitting then clinician must check for trigger point in the piriformis muscle and gluteus maximus muscle. In such cases the myofascial release techniques (MET) may be used. Also the patients, who report pain while changing position from sitting to standing, may be having excessive tone in levator ani muscle. In such cases the prolonged stretching of the external anal sphincter (which also acts on the tight levator ani muscle, due to common nerve supply of both) leads to relaxation of muscles [10].

3.2.1.2. Levator ani massage [40]

The patient lies in lateral decubitus/prone position and the clinician wears glove with the anesthetic lidocaine gel on finger tip. The palmar surface of the index or middle finger of the operator scans the beam across the levator possible length. These massages may be combined with contraction-relaxation techniques or Muscle energy technique of external anal sphincter muscle to further alleviate pain [20]. In this technique, the operator stretches the levator ani and the patient makes effort to restrain this stretch for 3–4 seconds. Stretching is repeated 3–5 times on each side. These methods are found to be effective in cases when the spasm of surrounding muscles have significant contribution to the pain and only if there is no disc lesion present between coccyx segments.

3.2.2. Coccyx manipulation

Manipulation of coccyx [16] is done by directly pulling the tip of the coccyx in antero-posterior or medio-lateral direction. In the sitting position (with spine fully flexed) or in side lying or prone lying position therapist via rectal route inserts his finger to reach the tailbone's anterior tip of the tailbone. The tip is

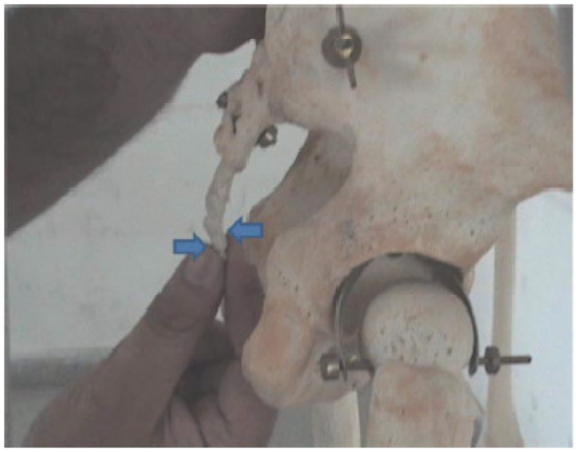

Fig. 1. The therapist inserts his/her right index finger in the rectum and holds the coccyx between thumb and forefinger to mobilize extension or lateral flexion and rotation. (Colours are visible in the online version of the article; http://dx.doi.org/10.3233/BMR-2012-0355)

Fig. 2. Maigne technique of coccyx manipulation: therapist stabilizes sacrum with the heel of hand and then with index finger presses against the volar aspect of coccys to push it into hyper extension. (Colours are visible in the online version of the article; http://dx.doi.org/10.3233/BMR-2012-0355)

pulled backward and then have the patient sit upright slowly, which will bring the tip of the tailbone down onto therapist's hand (Fig. 1). If the inferior tip of the coccyx doesn't come into hand, it is pulled gently posterior and superior with finger.

In a technique [19] of coccyx manipulation (Figs 2 and 3), the patient in prone lying position, the therapist inserts his one index finger into the rectum and the volar finger is pressed against the coccyx to maintain the coccyx in hyper-extension. The therapist by keeping the "heel" of the other hand on the upper part of dorsal aspect of the sacrum applies a gradual and strong pressure on sacrum. The pressure is given in bouts of 20–30 seconds, while the index finger still maintains the coccyx hyperextended. In between the traction is also applied on coccyx in longitudinal direction.

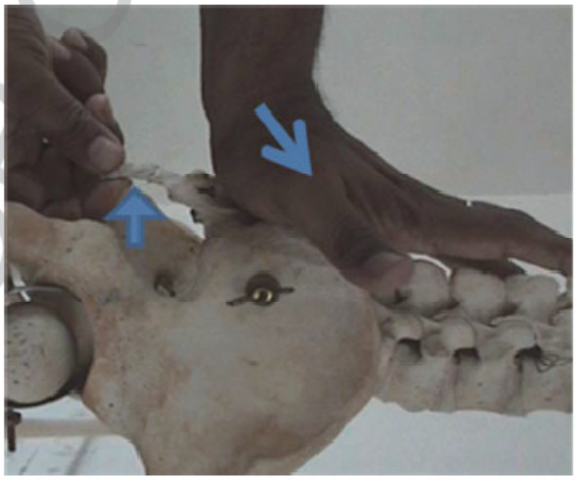

Fig. 3. R. Maigne's technique of Coccygeal mobilization. The coccyx is kept in hyperextension, which stresses the Sacrococcygeal and intercoccygeal joints and stretches the levator anus. (Colours are visible in the online version of the article; http://dx.doi.org/10.3233/BMR-2012-0355)

3.2.3. *Taping for coccydynia*

For the taping in coccydynia, two type tapes are used a white latex-free elastic underwrap, and a highly adhesive brown adhesive tape which creates (Fig. 4) and maintains tension. The underwrap (white tape) is first applied on the skin over sacrum. One end of the brown tape is attached to tip of coccyx, and then this tape is pulled upwards in an attempt to distract (pull out) the coccyx from its flexed position. An additional piece of tape may be used to pull the coccyx either toward the right or the left, in cases where the coccyx is deviated towards one side.

3.2.4. *Electrotherapeutic modality*

Due to deep location of coccyx segments and high variations in the etiology, no conclusive results are available for application of therapeutic modalities in coccygodynia. Short wave diathermy (SWD) due to its deep influence may help to improve the temperature and circulation in the region and thus help in the healing process [40]. None of the quality controlled study has established a clear beneficial effect of therapeutic modalities in the pain of coccyx origin. Few studies have attempted to evaluate the influence of sacral nerve stimulation [15] using electrotherapy techniques on the coccyx pain; however this is still under investigations [25].

Fig. 4. With the help of taping the Tip of coccyx is pulled upward to distract it from its flexed position. (Colours are visible in the online version of the article; http://dx.doi.org/10.3233/BMR-2012-0355)

Electrical Spinal Cord Stimulation (*SCS*) [7] consists of modulating or modifying the pain signal by means of an electrical stimulus applied to the posterior or dorsal columns of the spinal cord, thereby inducing pleasant paresthesia over the painful area. The technique is performed by using a multi-electrode system applied at epidural level. When the externally applied stimulus frequency is more than that of the natural firing frequency of the nociceptor of the [25] area then this externally applied stimulus suppresses the nociception and produces analgesic affects. TENS (transcutaneous electrical nerve stimulation) could be a more common alternative for the same, however this only temporarily inhibit the pain and not cure the pathology of the coccyx pain.

3.2.5. Local injections

Under fluoroscopic guidance the injection is inserted in to the affected disc or synovial joint and then corticosteroid is injected. In a study by Maigne et al. [18], it was established that patients with luxation or hypermobility were better responders to a local intradiscal corticosteroid injection than patients with normal coccyges. About two months after the injection, 50% of the patients with luxation or hypermobility were improved or healed, whereas only 27% of the patients with normal coccyges improved.

In acute cases of coccygodynia the injections are found to provide promising reduction in the pain [29]. Sometime the symptoms of coccygodynia may be result from the abnormal calcium crystal deposition [34] in the coccyx portion. This should be suspected especially in the cases where patients present with severe pain without any trauma or where analgesics help to reduce pain in rest or standing positions but fail to alleviate pain while sitting. In such cases the lateral view of x-ray may reveal cloud like opacities or the calcification in the inter-coccygeal line. Such cases while in acute phase respond positively to the 1 mg/kg/day infiltration of prednisone or corticosteroid injection [34].

3.2.6. Postural advice

Avoiding sitting for prolonged periods on hard surface; alternate sitting on each side of buttock; sit with leaning forward; using custom pillow to offload coccyx are some common postural advice used for coccygodynia patients.

4. Surgery procedure

Surgical interventions for partial or total coccygectomy are method of choice in cases where conservative interventions fail to provide pain relief and disability reduction [4]. The success of surgical procedures among refractory cases of coccygodynia varies from 83.3% [21] to 91% [5].

Wray et al. [5] in the prospective study, performed coccygectomy in 20% of patients who failed to respond to either local infiltration or manipulations and infiltrations, with symptom relief in up to 90% of cases. These results contrast with those of Tilscher et al. [14], who after analyzing 19 cases of coccygodynia (with coccygectomy performed in 11 patients) recorded no long-term favorable results.

In an surgical approach Kubilay et al. [24] conducted coccygectomy on 14 patients of coccygodynia who failed to respond to conservative means. After surgical procedure the follow up to 48 months revealed excellent to good outcomes in 12 patients (86%) and poor outcome in one patient. Elyazid et al. [30] reported that after partial coccygectomy the pain subsides gradually and the maximum relief occurs on average 15 weeks and no improvement occurs after 6 months from the date of surgery.

Maigne et al. [19] was to validate an objective method of selecting patients for coccygectomy. They enrolled 37 patients with coccygodynia due to Coccygeal instability associated with intermittent subluxation (65%) and hypermobility of the coccyx (35%); in the 2-year follow-up they obtained there were 23 excellent and eleven good (91%), and three poor results. This appears to be one of the best results of the literature. The conclusion of this study found poor results of coccygectomy performed in cases of coccygodynia

Table 1

Extracted data from papers

Author, date, country	Type of injury	Participant inclusion criteria	Exclusion criteria	Study design	No of subject/ Male/Female	Outcome measures	Interventions	Timeline/ Follow up	Results
Chin-Li Wu et al., 2009; Taiwan [40]	Coccygodynia	Pain and tenderness over coccyx	Prior manual treatment Anorectal pain	Correlation	$n = 53$ $M = 6$ $F = 47$	0–10 NPRS IRT recorded surface temperature	Thiele massage to levator ani and Coccygeas muscle + Continuous SWD	3 sessions/ week for 8 weeks 12 week follow-up	Significantly correlation b/w NPRS improvement and temperature decrement
Maigne JY et al., 2006; France [20]	Coccydynia	Chronic (>2 months) coccydynia Age 25–70	Prior manual treatment Occupational etiology	Randomized open study	Manipulation Grp 51, 6F + 45M Control Grp 51, 6F + 45M	100 mm VAS MPQ Paris Q DPQ	Three 5-minute sessions of intrarectal manipulation, over a period of 10 days Levator ani massage MET for external sphinchter Control group received sacral SWD	6 months follow-up	VAS reduced by 26% in manipulation Grp and by 14% in control Manipulation is more effective in patients having lower score of MPQ, Paris Q and DPQ or for the patients without coccyx instability
M. Zayer, 1996 [32]	Chronic coccygodynia	Coccyodynia refractory to conservative means for atleast 1 year	–	Retrospective descriptive study	10 patients, Coccygectomy had been done in past				Patients having simultaneous L-S disc pathology, neurosis or anxiety have poor outcomes after coccygectomy,
Birender Balain et al., 2006, UK [42]	Intractable coccydynia	Patients who had undergone coccygectomy		Retrospective correlation study	38 patients who had undergone coccygectomy in past over 16 years		Disc specimen samole from SC and IC discs were histologically assessed	83.3% patients with severe to moderate disc changes improved after coccygectomy while only 57.1% of mild disc changes improved.	Coccygectomy is successful for a majority of severely disabled patients with coccydynia.
Michael L. R et al., 2003 [29]		Idiopathic coccygodynia patients who had taken local injection and manipulation for > 4 year		Retrospective Review Study	23 patients who had taken local steroid infilteration 15 patients had undergone coccygectomy			1 year follow up	In case of conservative t/t had success rate of 78% (17 out of 23 patients) Success rate was 87% in surgical group

Table 1, continued

Author, date, country	Type of injury	Participant inclusion criteria	Exclusion criteria	Study design	No of subject/ Male/Female	Outcome measures	Interventions	Timeline/ Follow up	Results
Steen H et al., 1990 [13]	32 had traumatic coccygodynia 21 had coccygodynia without specific history of trauma	65 patients who had undergone coccygectomy at Copenhagen Had failure of conservative means atleast for 6 months before surgery		Retrospective review study	65 58 F + 7M	QOL score Rectal palpation		After operation the follow up was done up to 15 years	Over 80% patients had satisfactory outcomes after the surgery of total coccygectomy. 17% patients reported dissatisfaction after surgery but no objective signs were found of pathology. These patients were found to have neurotic personality too. Coccygectomy is good option but its results are unsatisfactory among the neurotic patients.
Maigne JY et al., 2000a [19]	Chronic coccygodynia	Chronic coccydynia (the pain in or around coccyx without low back pain or radiation. This pain must be more than two months duration).	Low back pain Radiation of coccyx pain	Correlation study to find relation between BMI, duration or onset and the inter-coccyx joints mobility with the chronicity of pain.	208 patients	Lateral X ray after 10 minutes of standing and after sitting in the most painful position. Angle of motion was measured as sagital rotation movement of coccyx while sitting in most painful position.	Dynamic lateral views of X rays were taken in stnding and then sitting in most painful position.	Single session study	Three factors are utmost important: BMI, time since onset of pain, pain while coming from sitting to standing.
Kim and Suk 1999 [33]	Chronic coccygodynia.	Coccygodynia patients receiving the conservative treatment for more than 12 monts.		Retrospective correlation study.	32 patients	Lateral view of x ray to measure intercoccygeal angle.			Intercoccygeal angle is higher (> 72 degrees) in idiopathic group while compared to that of the traumatic group (approx 48 degrees) Idiopathic group due to high amount of intercoccyx movement have poor outcomes of conservative measurement.
Lydia Morris and Roberta A. Newton, 1987 [28]	Levator Ani syndrome		Levator ani syndrome		28 subjects	VAS	HVPGS electrical nerve stimulation		7% patients received complete pain relief by HVPGS stimulation

Table 1, continued

Author, date, country	Type of injury	Participant inclusion criteria	Exclusion criteria	Study design	No of subject/ Male/Female	Outcome measures	Interventions	Timeline/ Follow up	Results
Wray et al., 1991 [5]					120 subjects, both male and females		steroid injections and local anesthesia vs. Manipulation and injection		60% of patients responded to local injections of corticosteroid and local anaesthesia. Manipulation and injection was even more successful and cured about 85%
Doursounian et al., 2004 [27]	Chronic coccyx pain	Participants with instability related coccygodynia			61 patients, 49 F and 12 M		Unstable tip of coccyx was removed by incision over coccyx tip	Follow up more than 30 months	53 patients reported excellent outcome after 30 months follow up
Duk-Hoon et al., 2005 [9]	Levator ani syndrome			Comparison between local injection and the EGS treatment.	53		EGS group received EGS treatment twice a week Local injection group received local injection of a 40-mg triamcinolone acetonide mix with 1 ml 2% lidocaine into the maximal tender point	Follow-up at 1, 3 and six months	LI group showed better short-term results than the EGS group

Keys: NPRS- Numerical pain rating scale; IRT- Infra-Red Thermography; MPQ- McGill Pain Questionnaire; Paris Q- paris questionnaire; DPQ- Dallas Pain Questionnaire; MET- muscle energy technique; L-S- lumbo-sacral disc; SC- sacro-coccygeal: IC- inter-coccygeal; QOL- Quality of life questionnaire; M- male; F- females; VAS- Visual Analogue scale; HVPGS- High voltage pulsed galvanic stimulation; EGS- electro galvanic stimulation; LI- local injection.

associated with pain radiating beyond the coccyx, low back pain, depression, or psychological problems.

However previous literature reveals that the results of coccygectomy remain unsatisfactory in the patients having pre-existing low back pain or spinal surgeries.

Further it is important to ensure before coccygectomy that the patients's symptoms are related to coccyx, and not to the emotional unstable nature. Steen and Hans [13] had reported that the patients who are emotionally unstable, would not respond to the surgical interventions, probably because the pain response in them is not due to coccyx pathology rather it is due to their emotional reactions.

If patient reports pain in sitting position but no pain in side lying (decubitus) position then radiological findings of standing and then painful sitting positions may reveal subluxation of the unstable coccyx segment upon sitting [23]. In such cases the sitting postural habits modification is recommended, but its failure may warrant surgical interventions because not all such patients respond positively to conservative methods. If patient is obese then it may further necessitate the surgical interventions.

Traumatic coccygodynia respond more positively to the surgical interventions as compared to the idiopathic coccygodynia which respond more favorably to the conservative methods [30]. Partial coccygectomy is found to have higher incidence of surgical failure as compared to the complete coccygectomy.

Maigne et al. [21] have proposed few clinical features suggestive of coccyx instability which requires the surgical interventions for the management of pain and disability. These include (a) Sharp pain while passing from the sitting to the standing position; (b) History of local trauma sustained less than one month previously; (c) Occurrence after childbirth; (d) Body mass index more than 27; (e) Maximum tenderness over the sacrococcygeal or intercoccygeal joints, rather than over the coccygeal apex.

Coccygectomy is a method of choice for the cure of those patients who do not respond positively to the conservative means. The total coccygectomy is found to have better outcomes while compared to the partial coccygectomy. However this method of treatment fails to give significant satisfaction in cases where the disc pathology is simultaneously associated in the sacrococcygeal region. The results remain invariable (yet grossly unsatisfactory) among the patients who present neurotic personality. Such patients do present very talkative nature, a long list of complaints and no objective tenderness or pathological signs could be elicited correlating with the complaints [38]. Identification of such patients is important before surgery because they are not satisfied even after the surgery. Thus surgery is not a recommended option in such patients if the objective findings don't correlate with their complaints.

The application of *Lumbar Epidural Block* might be useful in cases of coccygodynia caused by lumbar disc herniaion [14].

Sacral Rhizotomy [3,14,36,39] involving chemical methods (phenol, alcohol) have been shown to be scantly effective and might cause a high incidence of undesirable effects such as deafferentiation. This technique is only indicated when the pain is attributable to damage of the distal nerve roots, in the context of cauda equina syndrome [12]. The long-term effect of sacral rhizotomy S-4 and S-5 in 24 patients with coccygodynia was evaluated by Albrektsson [3]; only 6 patients responded well, all of them with symptoms associated with Coccygeal tenderness.

Radiofrequency-Induced Nerve Root Damage [5] constitutes a novel technique that might find applications in the treatment of purely mechanical pain and in painful syndromes with an important sympathetic component.

5. Exercise therapy

While searching the databases for the coccyx related pain, it was found that the exercise therapy aspect is almost completely ignored in previous literature. We didn't come across any study which focused on active exercise regimes to control the position of sacrum and coccyx in order to alleviate the pain and disability related to coccyx pain. Almost all interventions that we could found were passive mode to certain extent. Coccyx does provide attachments to many muscles and ligaments of pelvic floor group, therefore by training of these muscles to certain extent in meticulous way there can be expected some change in the magnitude and nature of the coccygodynia, however none of the study attempted to evaluate this aspect. Furthermore it is a well known fact that the position and orientation of coccyx tip [35] might be influenced by the position of upper thoracic and lumbar spine, and sacroiliac joint due to its closed kinetic chain nature [8].

Future studies must be done to evaluate this aspect. As per the clinical experience of the authors of this review, it has been seen that idiopathic patients of coccygodynia do respond favorably to the multifidus and transverses abdominus muscle training, quadripud po-

sition cat and camel exercises. Further it has been experienced that most patients of idiopathic coccygodynia do have out flared ilium bones, and their pain alleviated when the glutei pumping exercises are suggested. Further the patients with idiopathic coccygodynia without any coccyx fracture do respond to LILT (low intensity laser therapy) and moist heat pack treatment. However in the absence of any available literature or RCTs from the searched database, we cannot establish it as evidence based approach. Further studies in controlled manner can be done to evaluate this aspect.

6. Conclusion

This review highlights the major factors that must be identified while designing the management strategies for coccygodynia. Numerous conservative methods and the surgical options have been used since ages for the cure of coccyx pain. This review also highlighted that both conservative and surgical interventions have their own success and failure rates. Through this review, we found that manual therapy is the best option for treating the Coccydynia/Coccygeal pain. Apart from manual therapy, other techniques such as massage, taping, hot fomentation are also effective in rehabilitation of such cases. HVPGS (high voltage pulsed galvanic stimulation) is one of the options for relieving pain. Coccygeal excision is the last resort available when conservative treatment fails to alleviate Coccydynia.

Lastly, we recommend that newer modalities (like laser) and newer manual techniques, which may be beneficial in treating Coccydynia should be tested, and further research should be carried out, in future.

Acknowledgement

Authors are thankful to Dr. Manda Chauhan, for giving support to work in the department of physiotherapy, Pt. DDU IPH. We acknowledge Ms. Ashna for her help during different phases of work. This study has no conflict of interest.

References

[1] A. Jaiswal, A.P. Shetty and S. Rajasekaran, Precoccygeal epidermal inclusion cyst presenting as coccygodynia, *Singapore Med J* **49** (2008), e212.

[2] A.H. MacLennan, The role of the hormone relaxin in human reproduction and pelvic girdle relaxation, *Scandinavian Journal of Rheumatology* **88** (1991), 7-15.

[3] B. Albrektsson, Sacral rhizotomy in cases of ano-coccygeal pain, *Acta Orthop Scand* **52** (1981), 187-190.

[4] B. Capar, A. Naci, K. Erdogan, M. Salih and T. Adil, Coccygectomy in patients with coccydynia, *Acta Orthop Traumatol Turc* **41** (2007), 277-280.

[5] C.C. Wray, S. Easom and J. Hoskinson, Coccydynia: Aetiology and treatment, *J Bone Joint Surg [Br]* **73** (1991), 335-8.

[6] C.E. Noe and R.F. Haynsworth, Lumbar radiofrequency sympatholysis, *J Vasc Surg* **17**(1993), 801-806.

[7] C.L. Sadowsky, Electrical stimulation in spinal cord injury, *Neuro Rehabilitation* **16** (2001), 165-9.

[8] C.K. Anderson, B.D. Chaffin, G.D. Herrint and L.S. Matthews, A Biomechanical Model Of The Lumbo-sacral Joint During Lifting Activities, *Journal of Biomechanics* **18** (1985), 571-584.

[9] D.H. Park, Y. Soog, U.K. Kuhn, D.Y. Hwang, H.S. Kim, J.K. Lee and K.Y. Kim, Comparison study between electrogalvanic stimulation and local injection therapy in levator ani syndrome, *International Journal of Colorectal Disease* **20** (2005), 272-276.

[10] F. Baldissera, H. Hultborn and M. Illert, Integration in spinal neuronal systems, In: J.M. Brookhart, B. Vernon, V.B. Montcastle, eds, Handbook of Physiology: The Nervous System. Bethesda, MD: *American Physiological Society*, 1981: 509-96.

[11] F. Postacchini and M. Massobrio, Idiopathic coccygodynia, Analysis of fifty-one operative cases and a radiographic study of the normal coccyx, *The Journal of Bone and Joint Surgery (American Volume)* **65** (1983), 1116-24.

[12] F.H. Stern, Coccygodynia among the geriatric population, *J Am Geriatric Soc* **15** (1967), 100-102.

[13] H. Steen and H.S.V. Hans, Coccygodynia treated by resection of the coccyx, *Acta Orthop Scand* **61** (1990), 463-465.

[14] I.L. Tilscher, H. Kantor, W. Gangl and G. Bogner, Coccygodynia: A diagnostic and therapeutic problem in orthopedics, *Z Orthop Ihre Grenzgeb* **124** (1986), 628-632.

[15] J. De. Andres and S. Chaves, Coccygodynia: A proposal for an algorithm for treatment, *J Pain* **4** (2003), 257-266.

[16] J.B. Mennell, The science and Art of Joint Manipulation. London: Churchill, 1952.

[17] J.C. Yoon, S.H. Chang, S.Z. Yoon, S.U. Choi, H.W. Shin, H.W. Lee, H.J. Lim and S.M. Yoon, The effect of intermittent levator massage with caudal block on management of levator ani syndrome – A case report, *Korean J Anesthesiology* **57** (2009), 137-9.

[18] J.Y. Maigne and B. Tamalet, Standardized radiologic protocol for the study of common coccygodynia and characteristics of the lesions observed in the sitting position, Clinical elements differentiating luxation, hypermobility, and normal mobility, *Spine* **21** (1996), 2588-93.

[19] J.Y. Maigne, D. Lagauche and L. Doursounian, Instability of the coccyx in coccydynia, *J Bone Joint Surg [Br]* **82** (2000 b), 1038-41.

[20] J.Y. Maigne, G. Chatellier, L.F. Michel and A. Marie, The Treatment of Chronic Coccydynia with Intrarectal Manipulation, *Spine* **31** (2006), E621-E627.

[21] J.Y. Maigne, L. Doursounian and G. Chatellier, Causes and mechanisms of common coccydynia: Role of body mass index and coccygeal trauma, *Spine* **25** (2000), 3072-9.

[22] J.Y. Maigne, S. Guedj and B. Fautrel, Coccygodynia: value of dynamic lateral x-ray films in sitting position, *Rev Rhum Mal Ostéoartic* **59** (1992), 728-731.

[23] J.Y. Maigne and S.S. Guedj, Catherine, Idiopathic Coccygodynia Lateral Roentgenograms in the Sitting Position and

Coccygeal Discography, **19** (1994), 930-934.
[24] K. Kubilay, I. Serkan, I. Kaan, K. Nazim, K. Yaman and A. Nevres, Coccygectomy in the treatment of coccygodynia, *Acta Orthop Belg* **70** (2004), 583-585.
[25] K.M. Alo and E. McKay, Selective nerve root stimulation (SN for the treatment of intractable pelvic pain and motor dysfunction: A case report, *Neuromodulation* **1** (2001), 19-23.
[26] K.L. Moore and A.F. Dalley, Clinically Oriented Anatomy, 4th edition. Philadelphia, Lippincott Williams & Wilkins, 1999, p. 350.
[27] L. Doursounian, J.Y. Maigne, F. Faure and G. Chatellier, Coccygectomy for instability of the coccyx, International *Orthopaedics* **28** (2004), 176-179.
[28] L. Morris and R.A. Newton, The use of High Voltage Pulsed Galvanic Stimulation for patients with Levator Ani Syndrome, *American Journal of Surgery* **10** (1937), 1522-1525.
[29] L.R. Michael, S.T. John, N. Arvo, L. Stromberg and R. David, Coccygodynia: Treatment, *Orthopedic Journal* **26** (2003), 403-405.
[30] M. Elyazid, G. Raffaele, C. Francois, M. Biagio, T. Nicolas, B. Olivier, M. Nicola and S. Constantin, Post traumatic coccygeal instability, *The Spine Journal* **6** (2006), 544-549.
[31] M. Patrick, Foye, J. Charles and S.K. Matthew, Coccyx Pain. http://emedicine.medscape.com/article/309486-overview. accessed on 7th june, 2010.
[32] M. Zayer, Coccygodynia, *The Ulster Medical Journal* **65** (1996), 58-60.
[33] N.H. Kim and K.S. Suk, Clinical and radiological differences between traumatic and idiopathic coccygodynia, *Yonsei Medical Journal* **40** (1999), 215-220.
[34] R. Pascal, J.Y. Maigne and B. Thomas, Coccydynia Related to Calcium Crystal Deposition, *Spine* **33** (2008), E620-E623.
[35] R.L. DonTigny, Function and Patho-mechanics of the Sacroiliac Joint: A Review, *Physical Therapy* **65** (1985), 35-44.
[36] S. Albrecht, M.J. Hicks and B. Antalffy, Intracoccygeal glomus bodies and their relationship to coccygodynia, *Surgery* **115** (1994), 1-6.
[37] S. Hellberg and H.H. Strange-Vongsen, Coccygodynia treated by resection of the coccyx, *Acta Orthop Scand* **61** (1990), 463-465.
[38] S.C. Saris, J.M. Silver, J.F. Vieira and B.S. Nashold, Sacrococcygeal rhizotomy for perineal pain, *Neurosurgery* **19** (1986), 789-793.
[39] W. Chin Li-U, Y. Kwong-Leung, C. Tien-Wen, C. Chia-Hsin, C. Hung-Yi and H. Mao-Hsiung, The Application Of Infrared Thermography In The Assessment Of Patients With Coccygodynia before and After Manual Therapy Combined With Diathermy, *Journal of Manipulative and Physiological Therapeutics* **32** (2009), 287-293.
[40] W. Platzer, Werner. *Color Atlas of Human Anatomy, Vol. 1: Locomotor System* (5th ed.), Thieme, 2004.
[41] Y. Xiani, A.K. Jennifer, P.N. Martyn and M.F.N. Poul, A Quantitative Description of Pelvic Floor Muscle Fibre Organisation. *Computational Biomechanics For Medicine* **2** (2011), 119-130.
[42] B.Z. Balain, S.M. Eisenstein, G.O. Alo and A.J. Darby, Coccygectomy for Coccydynia: Case Series and Review of Literature, *Spine* **31** (2006), E414-E420.