


Headaches are widely prevalent, as more than 50% of the general population will develop headache within a year. Furthermore, headache has a 90% lifetime history in the world population. However, only 3% of population would develop chronic headache. Many treatments do exist that are very effective in reducing headaches. This presentation will discuss infusion therapies, treatment modalities that are less common but very effective in intractable chronic headache conditions. In addition to presentations of current dihydroergotamine and valproate infusion protocols, we will also introduce magnesium as an essential element that, when administered intravenously, can decrease headaches. Additionally, this presentation will describe indications for lidocaine and ketamine infusions to improve pain from intractable chronic headaches.

### SP13 INFUSION THERAPIES IN CHRONIC HEADACHE

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#### Headaches

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### SP14 RADIOFREQUENCY ABLATION OF VERTEBRAL BODY METASTASES

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Vertebral compression fractures occur due to osteoporosis or malignancy. Diagnosis is best done clinically and by MRI, CT. Most common malignancies associated with vertebral body metastases are breast, lung, prostate cancers. Multiple myeloma is in a special situation as over 70% of patients do have bone pain at diagnosis and about 55–70% have a history of vertebral body abnormalities. In the presence of the vertebral body metastases, back pain is prevalent. The common treatment of vertebral body malignant lesion is a vertebral augmentation procedure that is coupled with radiofrequency ablation of the identified metastases.

In this presentation we will discuss effectiveness of this combined technique in improving clinical outcomes by decreasing pain and control local tumor burden in cancer associated metastases of the vertebral body. We will also describe techniques, analyze potential complications, address managing possible adverse events and review the literature on best approach to this complex cancer related condition.
white blood cells, reparative cells, and progenitor cells. (Figure 1)

Platelet rich plasma (PRP)
Platelet rich plasma products deliver a supraphysiologic concentration of platelets to the affected area; they are used primarily in the acute/subacute musculo-skeletal conditions and some chronic pain states.

Their primary role is not to replace a damaged tissue but rather facilitate recovery. The platelets, anucleate cytoplasmic fragments derived from megakaryocytes, contain factors that are released during their activation; those are granules containing high level of signaling molecules and growth factors that are capable to signal mesenchymal stem cells and speed healing process. Table 1 summarizes the most common biological active proteins and their functions

PRP derived products bring the platelet concentration of blood to 3–8 times higher, contributing to the high count of growth factors and subsequently high concentration of signaling proteins. Many factors do influence obtaining an effective PRP product; some of them are listed below:

- Volume of blood used
- Use of anticoagulant, pre-procedure platelet and WBC count
- Type of injury or disease treated
- Number and interval between PRP injections
- Host microbiota and immune status

Providing optimal condition for achieving an optimal PRP product, and applied in optimal chronic pain condition, it is expected that all healing phases will decrease in length with the remodeling phase being the most affected and the inflammatory phase the least affected (Figure 2).

Classification of the PRP products is made based on the presence of platelets, leucocytes, and fibrin. As such 4 categories can be mentioned:

- P-PRP-pure PRP
- L-PRF-leukocyte and platelet rich fibrin
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- L-PRF-leukocyte and platelet rich fibrin

Most common indications for the use of PRP are tendinopathies, ligamentous injuries, muscle injuries, cartilage pathology injuries, subchondral bone disease and bone injuries. Fitzpatrick et al in a metaanalysis of randomized control studies evaluating the use of PRP in tendinopathies showed that Leukocyte rich PRP was more effective than the steroid injections in decreasing pain.1

For practical use of PRP in clinical practice, we identified several clinical pearls that can be used to adopt regenerative medicine techniques as treatment modalities for patients with chronic pain. Those are:

- An initial visit should consist of a detailed physical evaluation and diagnostic cell blood count,
- Advise patient to discontinue all NSAIDs, acetylsalicylic acid containing medications in the doses exceeding 81 mg one week prior to PRP treatment; those medications should be reinstalled more than 4 weeks after PRP treatment if possible.
- Advise patient to drink 3–4 glasses of water ½-1 hour prior to the procedure.
- Inform patient that a temporary restriction of movements in the treated area is advisable; the exception constitutes intra-articular injection of PRP.

Stem Cell Therapies-Bone Marrow Concentrates (BMC)
Bone marrow aspirates are usually used to concentrate stem cells; one of the common places to recruit those cells is the iliac crest; this location offers an easy accessibility, for needle insertion is easy and predictable. Furthermore, there is a high concentration of mesenchymal cells in the iliac crest aspirate; high volumes of 250cc or more can also be easily drawn from this location.

The technique used for aspiration can be performed using anatomical landmarks or under image guidance (fluoroscopy and ultrasound); regardless of the method, the use of multiple 10 cc syringes is preferred as it allows easy aspiration during many rotations of the aspiration needle placed in the iliac crest. Figure 3 shows our fluoroscopic guided technique for bone marrow aspirate with patient in prone position. By concentrating the bone marrow aspirate, the concentration of the desired cells increases to 2–8 times of original aspirate.

Effectiveness of the autologous mesenchymal stem cells was shown in a small study by D’Souza et al; the study showed that in knee osteoarthritis and chondropathy, decreased pain and enhanced function with PRP and autologous stem cells from bone marrow aspirate remain stable from end of treatment to 6 months post procedure.2

The use of regenerative medicine has also been investigated in spine disorders as an alternative to surgical treatments; conditions where effectiveness was seen are: intradiscal stem cells injections in disc pathology, intra-articular facet injections in chronic back pain, trigger point injections in whiplash, cervical and lumbar spine sprain. Data is currently emerging especially in the treatment of discogenic pain by stem cell therapies.

Other Regenerative medicine therapies
Several other regenerative medicine therapies have been used in clinical practice. Among those procedures, intradiscal sealing of annular fissures with fibrin sealants could potentially stop further herniation of nucleus pulposum. Several other techniques utilizing adipose tissue, placenta and amniotic cellular fluid have been used in various small case series and case reports, but those products are not considered autologous and as such their use may be subject to different regulation.

### Abstract SP6 Table 1

<table>
<thead>
<tr>
<th>Biological active protein</th>
<th>Function</th>
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</thead>
<tbody>
<tr>
<td>Platelet-derived growth factor (PDGF)</td>
<td>Fibroblast production, chemotaxis, collagen production</td>
</tr>
<tr>
<td>Insulin-like growth factor-1 (IGF-1)</td>
<td>Cell growth, differentiation</td>
</tr>
<tr>
<td>Transforming growth factor-beta 1 (TGF-β1)</td>
<td>Angiogenesis, extracellular matrix formation, cell viability</td>
</tr>
<tr>
<td>Connective tissue growth factor (CTGF)</td>
<td>Connective tissue growth</td>
</tr>
<tr>
<td>Vascular endothelial growth factor (VEGF)</td>
<td>New blood vessel growth and anti-apoptosis of blood vessel cells</td>
</tr>
<tr>
<td>Fibroblastic growth factor (bFGF)</td>
<td>Tissue repair, collagen production, myoblast proliferation</td>
</tr>
<tr>
<td>Epidermal growth factor (EGF)</td>
<td>Cell recruitment, proliferation, differentiation, promotion of epithelial cells</td>
</tr>
</tbody>
</table>

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1) Souza et al; the study showed that in knee osteoarthritis and chondropathy, decreased pain and enhanced function with PRP and autologous stem cells from bone marrow aspirate remain stable from end of treatment to 6 months post procedure.2
Conclusions Regenerative medicine is a novel, advancing way of treating chronic pain. There are limited studies currently, but evidence is evolving for the use and efficacy of regenerative medicine techniques as powerful tools in treating chronic pain.

indications for the PRP and BMC vary widely and are based on the regenerative technique and substance used. As such, platelet rich plasma (PRP) is more often used in musculo-skeletal conditions while use of mesenchymal stem cells have been reported to effectively treat intervertebral disc pathology.

REFERENCES