INTRODUCTION
Bone is a living material that is routinely exposed to mechanical environment which challenge its structural integrity. There are several causes of bone fractures. Bones can regenerate and form new osseous tissue where it is damaged or missing. In fact, healing of a fracture is one of the most remarkable phenomena of all the biological processes in the body. Bones are the framework of an individual body and breakage may occur to any bone that makes up the body. There are basically two types of bone fracture: hairline or simple fracture and compound fracture. In case, when the skin is intact in the area of fracture, it is called 'simple fracture', and when skin breaks open due to broken bones it is known as 'compound fracture'.

A fracture may cause extreme pain and tenderness in the injured area, swelling, a protruding bone or blood under skin, numbness, tingling or paralysis below the fracture. A major fracture may also cause a loss of pulse as well as weakness and inability to bear weight. Most fractures are caused by an accident, but some occur because of tumors, osteoporosis, or deficiencies of vitamin D or calcium. Fracture symptoms include limb deformities, limited limb functioning, shortening of limb in fractures of long bones, pain, grating sensation (if the broken bones end rub against each other), and swelling and discoloration of the skin overlying the fracture area. First-aid treatment for fractures should include covering any wound and immobilizing or splinting the broken part in its original position. Medical treatment involves repositioning the bone pieces in their normal position.

Nutrients aid in healing process by growing a bridge of tissue composed largely of protein fibers across the ends of the broken bones. Calcium and phosphorus deposits among these protein fibers thereby form a new bone. Therefore, diet must be high in protein and adequate in calcium and phosphorus. Also, diet should be high in calories to provide the energy necessary for new bone cell formation. Vitamin D intakes must be adequate because it is essential for maintaining normal blood levels of calcium. Vitamin K is used for healing bone fracture specifically in osteoporosis and postmenopausal woman. Calcium is known to decrease the incidence of bone fractures in postmenopausal woman, Potassium is required for cell formation, vitamin C is necessary for the maintenance and development of bones, and vitamin A helps to increase the rate of bone growth.

MODE OF ALACRITY
Fracture healing includes cell and tissue differentiation and proliferation. This process involves inflammatory cytokines, antioxidants, growth factors, bone building (osteoblast) and bone breaking (osteoclast) cells, amino acids, hormones and many nutrients. The mode of alacrity in case of fracture healing may be divided into three phases:

1. The Inflammation Phase: In fracture, a blood clot is formed which allows influx of inflammatory, clean –up cells to the area of wound, then cytokine cascade is started that brings the repairing cells into the fracture gap. These cells differentiate into specialized cells that build new bone tissue (osteoblast) and new cartilage (chondroblasts). These cells began the repair process and lays down new bone matrix and cartilage. At the beginning, the osteoclast cell dissolves and recycles the bone debris.

2. The Reparative Phase: The reparative phase begins two weeks after the fracture occurs. During this phase, proteins produced by chondroblast and the osteoblast consolidate into soft tissue. This soft, new bone substance hardens into a hard callus as the bone weaves together over a 6-11 week time period.

3. The Remodeling Phase: In this stage, callus matures and remolds itself. Woven bone is converted into stronger lamellar bone by action of both osteoblast bone formation cells and osteoclast resorption cells.

PROFICIENT HERBS FOR BONE FRACTURE TREATMENT


2. Bambusa arundinacea (Retz.) Roxb. Bambusa arundinacea (Retz.) Roxb. (Gramineae), commonly known as ‘bamboo’, causes decrease in inflammation thereby helping in fracture healing. It has benzoic acid, traces of cyanogenic glycoside, and a siliceous substance ‘tabasheer’ which helps in fracture healing. It also has calcium, phosphorus and zinc. Oral or topical application of paste of stem or leaves is used for fracture healing. Aqueous extract of crushed leaves can also be used for bone healing.

3. Bridelia Montana Wild. The bark and roots of Bridelia Montana Wild. (Euphorbiaceae) are used as astringent, antihelminthic and in the treatment of bone fracture. The root contains 5.7% tannins.

4. Cissus quadrangularis (Vitaceae) is considered to improve digestion and useful in piles, and used widely in healing of fractures.
fractures. The stem may be administered orally or applied topically to help heal fractures in dislocation and traumatic injury. The plant contains unsymmetrical tetracyclic triterpenes apart from δ-amin and δ-amyrone in the hexane extract. In addition, several alicyclic lipid constituent have also been reported. From the methanolic fraction, 3, 3′, 4, 4′-tetrahydroxy biphenyl has been isolated. The plant contains calcium oxalate, vitamin C (398 mg per 100g fresh, tender stem) and β-carotene. In clinical practice, in patients of jawbone fractures, it was found that addition of Ocimum sanctum and Cissus quadangularis, along with the usual management of fracture was found to reduce the period of immobilization significantly.  

5. Coelogyne cristata Lindl.  
Coelogyne cristata Lindl. (Orchidaceae) has osteosynthesis property due to its astringent and haemostatic action and presence of various trace minerals. It contains mainly calcium, phosphorous, zinc and β-sitosterol.  

6. Coriandrum sativum Linn.  
Coriandrum sativum Linn. (Apiaceae) has an astringent and aphrodisiac action, which might have activated the release of sex hormones resulting into accelerated healing process. It contains high amount of calcium, phosphorous, oxalic acid, vitamin A, B and C, iron, protein and fats. It heals chronic ulcers, rheumatism, swelling, neuralgia, bleeding piles etc. It is used orally as finely grinded fresh leaves or powder of dried seeds.  

7. Symphytum officinale Linn. (Knit bone)  
Symphytum officinale Linn. (Boraginaceae) removes the inflammation surrounding the fracture. It unites union of affected parts and contains allantoin, a crystallizable substance used in orthodox medicine to encourage epithelial formation in ulcer and wound.  

8. Colubrina asiatica Brongn  
Leaves of Colubrina asiatica Brongn. (Rhamnaceae) are used to treat bone fracture. An infusion of leaves may be used in obstetric conditions. The seed oil has antioxidant potential against a number of bacterial strains. It also possesses hypotensive, antispasmodic and cardiac depressant effects in experimental animals. The fruit part is reported to possess antifertility property and decoction of the fruit is used as an abortifacient. The leaves contain saponin, colubriniside and colubrine. The saponin present in the plant leaves show strong sedative activity. The seeds yield a pale yellow essential oil (2.1%).  

9. Salvia miltiorrhiza (Dan Sheng)  
Salvia miltiorrhiza (Lamiaceae) causes early formation of dense callus, and microscopic examination has also revealed the increased activity of osteoblast. Dan sheng could improve mandibular bone fracture. Dan sheng was used in an experimental group of rabbit with induced bone defects; it increases osteoblast activity to greater extent and also stimulates synthesis of protein in fibroblast.  

10. Ehretia cymosa  
The leaf poultice of Ehretia cymosa (Boraginaceae) is used to cover fractured area or for joint dislocation. The healing is accelerated as compared to no treatment. In a clinical trial to test bone remodeling potential, there was 112% increase in bone turnover using aqueous extracts of E. cymosa.  

11. Griffonia simplicifolia  
Roots and leaves of Griffonia simplicifolia (Leguminosae) are used to treat bone fracture. It is also used in congestion, as sedative, aphrodisiac and appetite suppressant for weight loss.  

12. Equisetum species (Horse-tail)  
Horse-tail (Equisetaceae) contains a considerable amount of calcium and other constituents. It is believed to be useful in the healing of the bone fracture and connective tissue injury. The plant also contains silica, an abrasive compound that makes horsetail an excellent pot scrubber, for hair rinse or facial scrub. Horse tail tea is used by herbalist as a urinary tract cleanser and it is often used in the treatment of urinary tract infections.  

13. Saraca asoca (Roxb.)  
The bark of Saraca asoca (Caesalpiniaeae) is bitter, astringent, refrigerant, anthelmintic, styptic, stomachic, febrifuge, demulcent and used in constipation. It is also used in dyspepsia, fever, dysipsia, burning sensation, visceromagnal, colic, ulcers, menorrhagia, metropathy, leucorrhoea and pimples. The dried flowers are used in diabetes and haemorrhagic dysentery and seeds are used for treating bone fractures, strangury and vesicle calculi.  

14. Terminalia arjuna (Roxb.) Wight & Arn.  
Terminalia arjuna (Combretaceae) contains tannins, arjunic acid, arjunatin, calcium carbonates and sodium chloride. The bark has haemostatic property. Powder of bark is used orally for bone fracture treatment.  

15. Vitex negundo L.  
The leaves of Vitex negundo (Lamiaceae) are employed in the treatment of body ache, headache, colic, cough, cold, eczema, bone fracture, ulcer and tooth ache. A pillow stuffed with the leaves is placed under the head to relieve headache.  

Table 1. List of some medicinal plant species used as proficient bone revivifying herbs are enlisted below  

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Botanical Name</th>
<th>Part Used</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alangium sativum (Alangia)</td>
<td>Leaves and bark are used for healing bone fracture</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Amorphophallus cam. Panulates (Araceae)</td>
<td>Leaf extract is used in preparation of medicated oil for bone fracture</td>
<td>19</td>
</tr>
<tr>
<td>3.</td>
<td>Angioptis evecta (Forst.) Hoffin. (Angiopteridaceae)</td>
<td>Stem and leaves paste applied for bone fracture</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>Bambusa tulda Roxb. (Bambusaceae)</td>
<td>Stem and leaves paste applied for bone fracture</td>
<td>20</td>
</tr>
<tr>
<td>5.</td>
<td>Angelica atropurpurea (Apiaceae)</td>
<td>Poultice of roots applied to heal broken bones, and whole plant or roots used internally, externally or in a steam bath to treat rheumatism</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>Angelica venenosa (Apiaceae)</td>
<td>Poultice applied to sprained muscles and twisted joints</td>
<td>14</td>
</tr>
<tr>
<td>7.</td>
<td>Aralia racemosa (Araliaceae)</td>
<td>Root decoction and poultice applied to heal sprains, strained muscles, and fractures</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>Buxus wallichiana Bail. (Buxaceae)</td>
<td>Bark paste is applied locally</td>
<td>21</td>
</tr>
<tr>
<td>9.</td>
<td>Catalopis gigantea (Linn.) R.Bre. at. (Apocynaceae)</td>
<td>Roasted leaves are bandaged locally</td>
<td>22</td>
</tr>
<tr>
<td>10.</td>
<td>Caryopteris odorata (Ham.) B.I. Robinson (Lamiaceae)</td>
<td>Wood paste applied as paste</td>
<td>21</td>
</tr>
<tr>
<td>11.</td>
<td>Cassia occidentalis L. (Fabaceae)</td>
<td>The plant parts are used for healing bone fracture</td>
<td>16</td>
</tr>
<tr>
<td>12.</td>
<td>Cnideum maculate (Apiaceae)</td>
<td>Decoction of plant is used to treat bruises, sprains, sore joints or broken bones</td>
<td>14</td>
</tr>
</tbody>
</table>
CONCLUSION

Medicinal plants constitute an effective source of traditional and modern medicines. Traditional herbal medicines have been the integral part of medical practice. The long tradition of herbal wisdom has employed various herbs to speed fracture healing. Natural medicinal products are now favorite among therapeutic substances in the West and drawing attention of scientists and pharmaceutical companies. Phytopharmacotherapy for bone and fracture healing is expected to be safe when compared with synthetic substances in the West and drawing attention of scientists and pharmaceutical companies.

REFERENCES

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