Advances Made by Dr. Paley in the past 22 years

Most of my advances have been in the field of deformity correction. My text book "Principles of Deformity Correction" introduced many new concepts on this subject most notably the idea of the Center of Rotation of Angulation (CORA method). These general concepts are the foundation of alignment surgery of the long bones. In addition to these principles I have developed many specific surgical therapeutics for different uncommon and rare diseases in children and adults for both the upper and lower limbs.

Advances in Treatment of Congenital Deformities/Deficiencies

Congenital femoral deficiency (CFD also known as PFFD): this is the most difficult of all congenital LLD conditions. I have developed the 'superhip' and 'superknee' reconstructions (to date I have performed 130 superhips and 150 superknees), which return the knee and hip to near normal anatomy and function. I also developed the method to lengthen the femur with a special hinge for the hip and knee to protect these joints. These advances have made it possible for children with CFD to lead normal lives with equal leg length without an amputation. I have performed more than 500 lengthening surgeries for CFD since 1987.

Fibular Hemimelia: presents a challenge of foot deformity and deficiency. I have developed the 'superankle' procedure to address this problem and prevent recurrence of foot deformity (to date I have performed over 75 superankle procedures). The superankle procedure combined with serial lengthening procedures allow equalization of leg length. I have performed more than 500 lengthenings for fibular hemimelia. My methods have been compared to amputation with prosthetic replacement and have been shown to give as good or better function (nearly normal) without the need for a prosthesis.

Tibial Hemimelia: the treatment depends on the degree of absence of the tibia. I am one of only two surgeons who has performed the special knee reconstruction where the patella (kneecap) is used to reconstruct the tibia (patellar arthroplasty). In patients without a patella I created a new operation to reconstruct the quadriceps, centralize and tether the fibula to the femur and create a stable knee joint. I have developed several new methods to reconstruct ankle in these patients. This is followed by lengthening surgery with a specially designed fixator construct. Despite its rarity I have successfully lengthened over 70 tibial hemimelia patients.

Radial Club Hand (RCH) and TAR syndrome: the treatment depends on the degree of absence. I developed a treatment for lengthening the partially absent radius combined with correction of the hand deformity for patients with a partially absent radius. For complete absent radius, I developed ulnarization (1999) which is the first method that leads to no recurrence of deformity. I follow this by lengthening of the forearm at age 8 and 12 to normalize forearm length. In patients with no thumb I also do pollicization to restore thumb function. Thrombocytopenia

(TAR) patients with hypoplastic thumbs can also have thumb reconstruction with tendon transfers and webspace widening. I have performed more than 30 ulnarization procedures and have performed more than 50 lengthening procedure for RCH.

Ulnar Dysplasia: I have developed 4 different strategies of lengthening for different degrees of ulnar deficiency. Most notable is a new method of reconstruction for the complete absence of the ulna. A novel humeral osteotomy stabilizes and reorients the elbow combined with rotational osteotomy with lengthening of the radius.

Madelung's Deformity: I developed a special intra-articular osteotomy with distal radio-ulnar joint reconstructon for Madelung's deformity. This reduces the bothersome bump of the ulnar head and restores the anatomy of the wrist joint to a more normal position.

Congenital Pseudarthrosis of the Tibia: I developed and published a new method for treatment of this rare debilitating condition. This includes open reduction of the pseudrthrosis site, resection of the periosteal tissues and replacement with a periosteal graft, autogenous bone grafting, insertion of BMP, intramedullary stabilization combined with external fixation and postoperative infusion of biphosphonate (zolidronic acid) to inhibit bone resorption. This shotgun technique has lead to union in 100% cases and has a low refracture rate.

Congenital Pterigium of the Knee: I recognized that the pathologic tissue is the fascia and therefore perform a subtotal fasciectomy combined with shortening of the femur, capsulotomy and relengthening. This method is very joint preserving for the knee joint. I have performed more than 20 congenital pterigium surgeries.

Advances in Multiple Hereditary Exostosis (MHE)

In the upper extremity I developed a 5 step method to remove the exostoses, correct the distal radius deformity, widen the interosseous membrane, lengthen the ulna and reduce the radial head. This is the first method that consistently improves the forearm rotation and shape and eliminates the bump of the dislocated radial head. In the lower extremity I use a combination of guided growth with hemiepiphysiodesis (8-plate) and osteotomy. I was one of the first to recommend routine nerve decompression with osteotomy to avoid nerve injury. I have also used safe surgical dislocation of the hip combined with hip osteotomy in MHE.

Advances in Achondroplasia and Hypochondroplasia

My method of extensive limb lengthening of both femurs and both tibias at the same time allows an increase in height of between 12-16 inches. Its biggest advantage is that it reduces the total external fixation time while permitting correction of limb-

trunk disproportion, rhizomelic disproportion and simultaneous correction of deformities. I have performed more than 400 lengthening surgeries for dwarfism. Final heights of over 5 feet tall are usual with these methods. The methods I developed have proven to be safe, predictable, and reproducible.

Advances in other Dysplasias

Extensive limb lengthening is also possible for other dysplasias including spondyloepiphyseal dysplasia, pseudoachondroplasia, diastrophic dwarfism, chondrometaphyseal dysplasia (McKusick, Jensens, etc). This requires a different approach where we treat one side at a time and span joints to prevent pressure. I developed this approach in 1988 and have performed more than 50 such surgeries.

Advances in Perthes Disease

I developed hip distraction for Perthes in 1988 and have treated more than 100 patients with this method since then. This method avoids osteotomy and burns no bridges and has a 95% success rate irrespective of age of onset. It is one of the only methods applicable to older children. I was also the first surgeon to adopt Dr. Nuno Lopes' (Portugal) technique of drilling of the femoral head and neck, a method that promotes rapid revascularization of the femoral head in early Perthes disease. Finally I am the first surgeon to apply the Ganz method of femoral head reduction osteotomy to reduce and reshape the femoral head size for older children that are symptomatic from the deformed femoral head(since 2006). I have successfully performed this procedure 15 times.

Advances in Melorheostosis

This is one of the rarest diseases. Since 1988 I recognized that open surgery just leads to more scar and worsening of joint contractures. I began using gradual distraction for these contractures which results in less stiffness. I have treated 10 patients successfully with this approach.

Advances in Joint Preservation

I have pioneered and improved on methods to preserve joints with arthritis. In many patients I am able to delay or prevent the need for joint replacement arthroplasty by specialized osteotomy realignment techniques and joint distraction techniques. This is especially applicable to the hip, knee and ankle. In the knee and ankle I developed new intra-articular osteotomies to normalize deformed joint surfaces.

Advances in Internal Limb Lengthening

I developed the lengthening over nail (LON) method in 1990 and switched to internal lengthening first with the Albizzia nail in 1994 and the ISKD in 2001. I have also used the Repiphysis lengthening prosthesis. I will be one of the first surgeons to be able to use the Phenix internal lengthening method and the Orthogon methods. I am also very familiar with the Fitbone method. While I have not developed these internal lengthening devices I remain one of the most experienced surgeons using them and have helped improve the surgical technique of their use.