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Tel.: +49 (0)231 / 55 70 50-50
Fax: +49 (0)231 / 55 70 50-70
E-mail: boecker@ot-forum.de
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Prosthetics

G. M. Street

Vacuum Suspension and its Effects on the Limb

Since its inception in 1999 (Board et al., 2001), vacuum suspension has proven to be a major innovation. Vacuum suspension provides the amputee with unmatched linkage. This linkage alters the pressures that the limb experiences, which in turn prevents daily limb volume loss and improves limb health. The purpose of this paper is to review what is known about vacuum suspension and its effects on the limb.

Vacuum Suspension

A vacuum pump removes air molecules from the thin, sealed air space (sheath) between the total surface weight bearing socket and liner as shown in Fig. 1. The vacuum created by the removal of these air molecules holds the liner firmly and globally to the socket wall as shown in Fig. 2a.

Note that the limb is completely isolated from the vacuum. This

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raises the question: How can this vacuum that is completely isolated from the limb affect it in any way? The answer to this question is addressed in detail later in this paper. However, the essence is that the liner, and therefore skin, are no longer able to separate from the socket. This lack of separation of the liner and limb from the socket is thought to explain why vacuum suspension prevents volume loss and improves limb health.

As shown in Figure 2b, the sum of the axial components of the liner anchoring forces creates an exceptionally large suspension force; ~70 kg for the average size limb (33 cm proximal circumference) and vacuum (-78 kPa) (Street, 2006). This means that it would take an extraction force of ~70 kg to cause any separation between the liner and socket. Since extraction forces during daily activities seldom exceed 5-10 kg, vacuum suspension prevents separation between the liner and socket (Board et al., 2001). This is in sharp contrast to all other modes of suspension where the liner separates from the socket as soon as even a small extraction force (<0.25 kg) is applied to the socket.

"The second major bonus is how well your device stays 'glued' to my leg, making the prosthesis feel much lighter and allowing me to wear work boots again. The previous system that locked the liner to the socket with a pin always felt heavy, and made work boots unbearable. Managing my horse farm with tennis shoes was often a challenge, particularly in the muddy months. Now work boots feel light, and are easy to walk in."

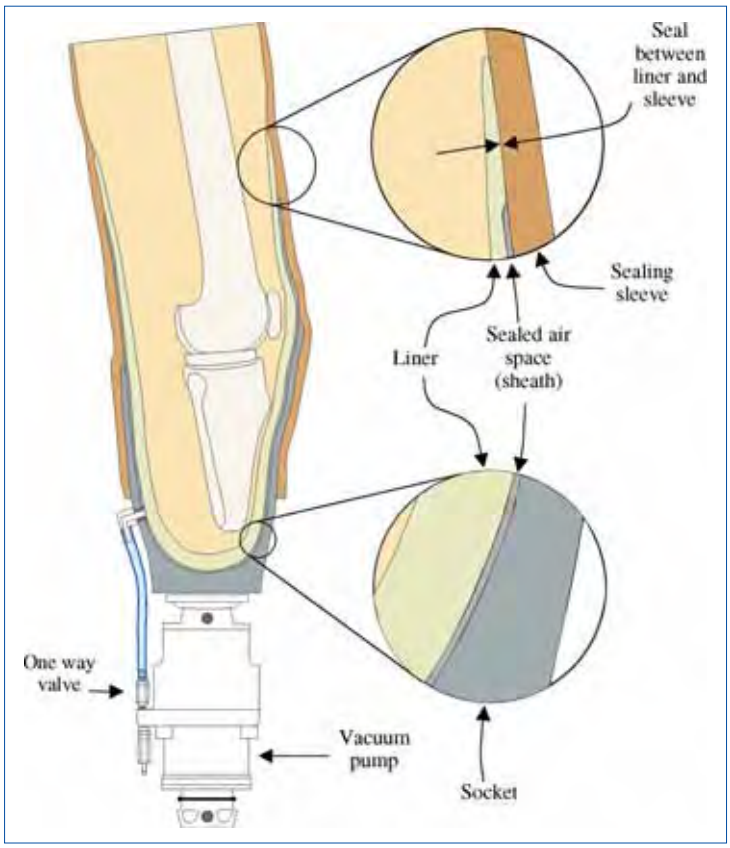

Fig. 1 *Cross section of vacuum suspension system showing sealed air space (sheath). Note that the sealed air space does not extend to the thigh. The seal between the top of the liner and sealing sleeve isolates the limb from the vacuum.*

Proprioception and Prosthesis Control

Eliminating separation between the liner and socket improves the patient's spatial awareness of (proprioception) and control over the prosthetic leg. Amputees new to vacuum suspension typically express surprise at how the prosthesis feels more a part of the limb. The prosthetic leg is more responsive; as the amputee moves his/her limb there is a corresponding, immediate movement of the prosthetic leg. The following unsolicited quote from an amputee that switched to vacuum suspension illustrates the functional significance of the improved linkage.

Limb Volume

Vacuum suspension further improves proprioception and control of the prosthesis by preventing the limb from losing volume during the day. Unlike all other modes of suspension where the limb loses volume each day and causes a sloppy fit, the limb stays hydrated and positively keyed to the socket.

The first trans-tibial amputees to use vacuum suspension in 1999 reported that their limbs no longer lost volume during the day. This unanticipated effect of vacuum suspension has since been confirmed in two studies (Board et al., 2001; Goswami et al., 2003) and patients continue to consistently identify daily volume maintenance as a major advantage of vacuum suspension.

A study comparing daily limb volume loss between valve and vacuum suspension showed that limbs of trans-tibial amputees lost an average 6.5% in volume during 30 minutes of walking with valve suspension. On a separate day, the same subjects in the same sockets, except with vacuum applied to the expulsion port (vacuum suspension), gained 3.7% in volume while walking. In a separate study (Goswami et al., 2003), it was again shown that vacuum suspension prevents daily volume loss or results in a slight gain.

Limb volume fluctuates as pressure fluctuates (Guyton, 2000). In the morning before donning the socket, with one atmosphere of pressure (1 atm), limb volume is stable. As limb pressure increases, for example after donning the undersized socket or during stance, the limb loses volume. Volume is lost because elevated (>1 atm) pressure increases the amount of interstitial fluid being driven back into the bloodstream and lymphatic vessels, and out of the limb. In contrast, as pressure drops below 1 atm, such as when the tibia extracts and causes the soft tissues to elongate during swing, the limb gains volume. Volume is gained because low (<1 atm) pressure increases the amount of fluid being drawn out of the blood stream and into the limb's tissues.

Hence, there are three possible explanations for why vacuum suspension prevents daily volume loss in ambulating amputees: 1) less fluid is driven out of the limb because of a reduction in positive pressure during stance, 2) more fluid is drawn into the limb because of a decrease in pressure during swing or 3) both. Beil et al. (2002) found that both changes

occur with vacuum suspension. Compared to valve suspension, vacuum suspension 1) reduces the external positive pressure by ~4-7% during stance and 2) increases the drop in pressure an additional ~27% during swing. So, vacuum suspension shifts the fluid balance in the limb to one of maintenance or slight gain by driving less fluid out of the limb during stance and drawing more fluid in during swing. Of these two, Beil et al. (2002) proposed that drawing more fluid in because of the additional 27% drop in pressure is probably most responsible for volume maintenance.

We hypothesize that this additional 27% drop in pressure is a result of the liner staying anchored to the socket and the skin staying in close contact with the liner. With the liner globally anchored, as the tibia extracts from the soft tissues during swing, the tissues elongate and tissue pressure drops to a greater extent than with other modes of suspension (Beil et al., 2002). With valve suspension, the liner/limb separate from the socket (Street, 2006); resulting in less tissue elongation, smaller drop in pressure and less fluid being drawn into the limb. With pin suspension, there is an interesting paradox. During swing, there is an even larger pressure drop than with vacuum suspension; an additional 9% at the distal end of the limb (Beil et al., 2002, Beil and Street, 2004).

The paradox is that while pin suspension is even more forceful in drawing fluids into the limb, it is only at the distal end of the limb while the proximal portion of the limb is squeezed. So, with pin suspension, instead of moderate (valve suspension) to strong (vacuum suspension) global filling of the limb, there is strong distal filling, with a predisposition for congestion of these fluids and volume loss proximally because of the simultaneous proximal squeeze.

Limb Health

There is considerable anecdotal evidence from amputees that shows vacuum suspension improves limb health. A few clinical studies, yet to be published, are underway to document this effect. A nearly universal observation with vacuum suspension is the reduction or elimination of minor skin problems such as folliculitis and recurring cysts. More impressive are the cases where open wounds heal and remain healed upon switching to vacuum suspension.

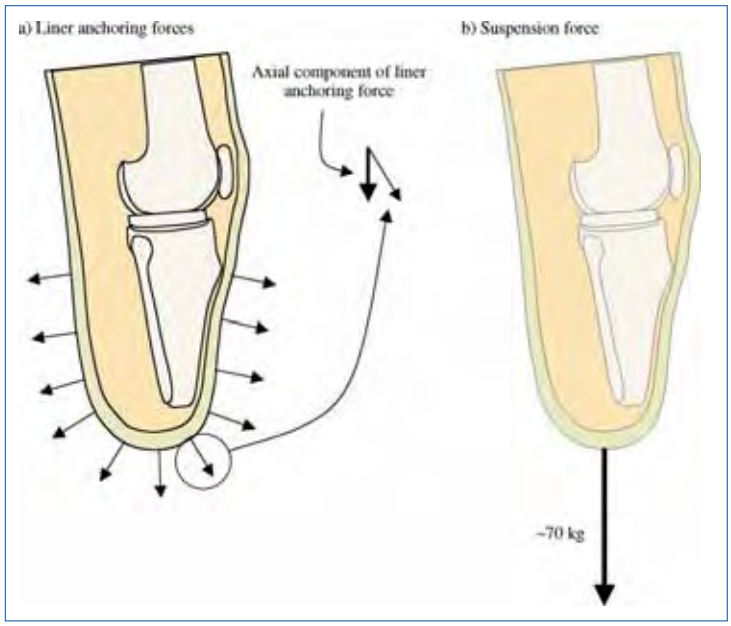

Fig. 2 *The vacuum creates forces that: a) anchor the liner to the socket. The sum of all the axial components of the axial forces creates a large: b) suspension force of ~70 kg. The suspension force prevents the liner/limb from extracting out of the socket.*

It should be emphasized that this healing occurs while the amputee wears the vacuum suspension prosthesis. In contrast, other modes of suspension normally require the limb be out of the prosthesis for healing to take place. The following unsolicited quote illustrates a typical experience of an amputee with chronic wounds after switching from pin to vacuum suspension.

"I have been a left below knee amputee for 3 years, and for most of that time struggled with pressure sores. Late last summer I developed two pressure sores on my distal stump that progressed into full-thickness erosions. I suffered with these painful sores for over 3 months before my doctor recommended that I have plastic surgery to resect them. Before I was able to make that appointment, I was called in by my prosthetist to try something new…your device. Within 2 weeks of wearing the [vacuum suspension] system, the pressure sores had completely healed. For the first time I can wear my leg all day in comfort. I used to go to bed for 2 hours as soon as I got home from work to give my stump a much needed break from the pressure. Last evening, after a 12-hour day at work, I stood in the kitchen and made supper for my family, and then did some work before calling it a night. Your innovation is nothing short of miraculous."

All prostheses place the limb in an unhealthy environment. The skin is subjected to pressures and shear forces that exceed those for which it is normally designed to withstand. Furthermore, the warm, moist socket environment is conducive for microbial growth; thus challenging the limb's immune system. Vacuum suspension has reduced the peak pressures (Beil et al., 2002) and shear forces because of its superior linkage and its maintenance of limb volume. Vacuum suspension has put an end to the abusive cycle where the fit becomes sloppy as the limb loses volume, causing the limb to hammer and bell clap in the socket, which in turn causes even more volume loss and limb trauma. The warm, moist socket environment remains an unresolved problem for all modes of suspension.

Aside from less physical abuse, a second likely explanation for the observed improvement in limb health and wound healing with vacuum suspension is increased blood flow (Street, 2002). Skin blood flow was measured as simulated walking pressures were applied to the limb. The cyclic, positive and negative pressures measured in an earlier study (Beil et al., 2002) were applied to the limb to simulate vacuum suspension. A clear pumping effect was observed in all trials. During simulated stance, blood was driven

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out of the skin blood vessels because of positive pressure. During simulated swing, the vessels rapidly refilled as the limb was exposed to negative pressure.

As of yet, no studies have been conducted to show that the increased blood flow improves limb health. However, it would have the potential to do so since blood is the delivery system that provides the limb with its nutrients and immune cells, and removes wastes. This coupled with the knowledge that vacuum suspension enhances fluid and nutrient exchange in the soft tissues strongly suggests that circulatory changes play a role in improving limb health and wound healing. Enhanced fluid exchange is thought to exist because of the observed limb volume maintenance as previously discussed.

The potential improvements in limb health and wound healing due to the global increase in blood flow and fluid exchange are probably most important when comparing vacuum suspension to pin suspension. Pin suspension creates a relatively strong distal draw while simultaneously constricting the limb proximally during swing phase (Beil and Street, 2004). This has the potential of causing distal limb congestion. In contrast, the pumping effect seen with vacuum suspension and valve suspension (to a lesser extent) appears to increase global circulation and fluid exchange, and avoid congestion.

Importance of Proper Fit

The benefits of vacuum suspension are only realized by the amputee if the limb and liner are in total contact with the socket. Meeting this requirement depends on the actions of the prosthetist and amputee. The prosthetist must design and construct a total surface weight bearing socket that closely matches the shape of the amputee's limb, and is free of specific weight bearing structures and areas of relief.

The amputee must maintain total contact by adding fillers if the limb loses volume. If both the prosthetist and amputee meet this requirement and vacuum is maintained, the amputee will reap the benefits of vacuum suspension. If they fail to meet this requirement, the limb will experience pressure, and skin damage in extreme cases, as the liner and limb are pulled into the void.

A properly fitting vacuum suspension system is almost certainly the healthiest environment for all limbs. This is especially true for vascular amputees or those on anticoagulants ("blood thinner" medication) who are prone to internal bleeding when exposed to high or low pressures and shear forces.

Vacuum suspension minimizes these pressures and shear forces because of the limb's positive global connection with the socket; a connection that is maintained throughout the day since limb volume is maintained.

Old Idea Revisited

Removing air molecules from the air space (sheath) between the socket and liner is a new concept. Yet, having the limb staying in close contact with the socket, and observing that it improves linkage and heals wounds is not new. Grevsten and Marsh (1971) and Grevsten (1977), who used a prosthesis with trans-tibial amputees that closely mimics vacuum suspension, reported that "all of the patients feel that the prosthesis is identified more closely with the lower leg" and that "all patients who were unable to wear the ordinary PTB prosthesis because of a skin lesion and who then tried the PTB-suction model noticed healing while using the new prosthesis." Grevsten and Marsh (1971) used a total contact, undersized socket. The trans-tibial amputee's limb was pulled into the socket using a stocking. After pulling the limb into the socket, the stocking continued to be pulled out the distal port until the limb was left in total contact with the socket. The hole was sealed with a threaded plug.

Since there was virtually no air in the socket, suction prevented any measurable separation between the skin and socket. So, as with vacuum suspension where the skin stays in close contact with the anchored liner, their suction system where the skin was held in close contact with socket demonstrated similar improvements in linkage and healing of wounds.

Summary

Vacuum suspension is simply the removal of air molecules from the sealed air space in a valve suspension system. The resulting vacuum has one direct physical effect; it anchors the liner to the socket. The large suspension force, ~70 kg, created by the axial components of the liner anchoring forces prevents separation between the liner and socket. This provides the amputee with unmatched linkage that improves his/her spatial awareness and control over the prosthesis. With this elimination of pistoning, limb pressures and shear forces are reduced, providing the limb with a healthier environment. Unlike all other modes of suspension, vacuum suspension prevents the limb from losing volume during the day. So, a healthier environment is maintained throughout the day. The global pumping effect of the cyclic positive and negative pressures during walking increases circulation and fluid exchange, and probably plays a role in improving limb health and wound healing.

Acknowledgements

I wish to thank the following former graduate students for their ground breaking research that improved our understanding of vacuum suspension and made this paper possible: Wayne Board, Tracy Beil, Jaideep Goswami and Marie Harlander. Thanks are also extended to the inventor of vacuum suspension, Carl Caspers, for his unwavering commitment to improving the lives of amputees, keen insight and friendship. I am also in debt to the many amputees and prosthetists; too numerous to mention here, that have been willing to share their practical knowledge about prosthetics.

Finally, I would like to thank my gifted and genuinely curious colleague, David Bacharach, for always taking the time and having the interest in helping our research team "get to the essence of things."

Author contact information:
Glenn M. Street, PhD
Human Performance Laboratory
HAH 111
St. Cloud State University
St. Cloud, MN 56301
USA

E-Mail: *gmstreet@stcloudstate.edu*

W. A. Munro, D. Stang, D. Jones

Clinical Effectiveness of the PRAFO-Diabetic Foot Ulcers

The authors recently won first prize for a poster entitled "Clinical Experience of the Pressure Relief Ankle-Foot Orthosis (PRAFO)" at the AHP Clinical Effectiveness and Practice Development Conference held in Polmont, Scotland. This note describes two cases from that study highlighting the severe challenge that diabetic foot care can present to the multi-disciplinary care team. The creation of a protective environment, relieving pressure and shear in the region of an ulcer site, is shown to be a powerful influence on healing. These cases also highlight the fact that orthotic interventions can be extremely cost-effective and generally represent just a small proportion of the total spectrum of treatment cost.

Background

Diabetic foot problems have long been recognised as a serious health care challenge and a situation in which prevention of tissue breakdown through attention to the mechanical loading upon tissue has been of great importance. It is now recognised that many amputations may be prevented through attention to appropriate foot care. Whether in healing or preventing foot ulcers, effective orthotic strategies are vital.

Fig. 1 *PRAFO – APU with pad and strap.*

Research has shown neuropathy to be the predominant causative factor in the development of foot ulceration [8]. In combination with repeated minor trauma, it is the primary cause of diabetic foot ulceration, rather than ischaemia [6].

Diabetic foot problems can develop extremely quickly, with tissue breakdown occurring rapidly and often complicated by infection [3]. Once ulcers are formed, they are often slow to heal. In recent years there has been a consensus that the wound healing process in diabetes contributes to the development of diabetic foot ulcers [7]. The normal course of wound healing in people with diabetes appears to be hindered by many factors, including specific metabolic deficiencies and impaired physiological responses [1].

The authors utilise a range of orthotic and other interventions based on an individualised clinical presentation and anticipated risk. The clinical process is truly multi-disciplinary with orthotist, nurse specialist and podiatrist working alongside other members of the team with a shared understanding of the plan.

Treatment Planning

An overall management plan must deal with both the "internal" medical environment – managing optimum blood sugars and infection for example, and the mechanical environment. Whether for prophylaxis or healing, there is a need to protect the foot from further mechanical damage which is about eliminating any pressure or shear at the wound site and adjacent tissue. The PRAFO allows mechanical support to be provided in the region of the heel and malleoli without requiring the wound site to be enclosed. This allows for exudate wound dressings to be monitored and changed according to need. To be effective the treatment plan requires good cooperation between the podiatrist and orthotist.

Ambulation, where possible, should be undertaken at the earliest opportunity to facilitate

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improved circulation. Mechanically it is important to provide controlled positioning of the foot and protection at initial contact of each stride. Controlled pressure distribution during stance phase allows the physiological norm to develop and aids venous return.

Early work using motion analysis and pressure sensing technology allowed the orthotist to verify that controlled adjustment of the posterior upright of the PRAFO was valuable to control pressure at the plantar surface of the foot. Adjustments manage the foot-ankle position and the time history of pressure distribution at the foot and heel. Lessons from this are now applied in routine practice. The aim is always to allow early, protected ambulation. Early mobilisation is good for patient morale and generally reduces pain.

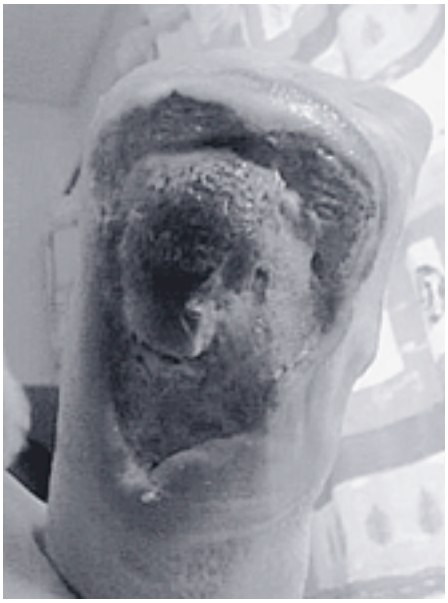

Fig. 2 *Initial presentation Case A.*

Our experience over seven years of using the Pressure Relief Ankle Foot Orthosis (PRAFO) (Fig. 1) with neuropathic and neuro-ischemic feet has allowed severe cases to be managed in addition to routine cases. This is highlighted with two cases.

CASE A – Observations

This individual initially presented from the community with a painful, sloughy, neuropathic ulcer. Poor compliance to diet/blood sugar regulation and other aspects of self care was recognised. The general care strategy was wound debridement, protection from further deterioration, attention to infection and blood sugars and consideration to amputation.

In this particular case, this individual declined amputation and so the challenge became one of careful management over a significant time. There are cost and ethical decisions to make around this type of case.

Care Process

- Referral from community-painful, sloughy, black heel with medial ulcer worsening after 6 weeks treatment by GP practice
- Wound drained, dressed, IV antibiotics, PRAFO at night
- 2 weeks; painful, worsening ulcer, calcaneum exposed; amputation suggested
- 2-24 weeks; cycle of debridement & dressing; IPOS during day; PRAFO at night
- 24 weeks removal of piece of calcaneal bone
- 54 weeks; no pain; callus debrided; area dressed; PRAFO still in use
- 156 weeks no pain; callus debrided; area dressed; PRAFO still in use

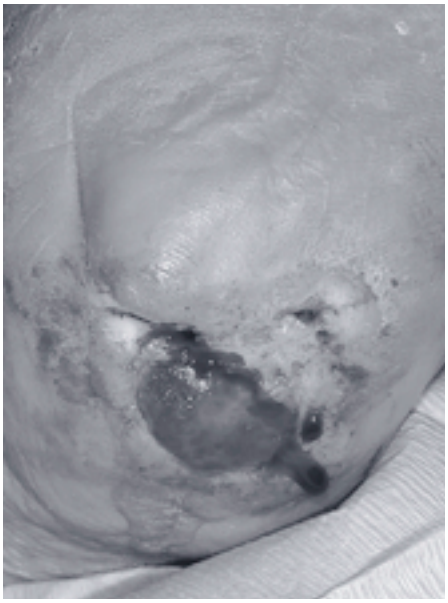

Fig. 3 *Case A at 156 weeks.*

Outcomes

At 160 weeks healing was established and amputation prevented. Long term multi-disciplinary care had been required with frequent nursing and podiatry professional input in addition to dressings and antibiotic care throughout the period. Two PRAFO had been used with liner changes and one IPOS hind-foot relief shoe had been used.

CASE B – Observations

This individual was involved in a road traffic accident fracturing his right femur and he was not initially recognised to be diabetic with neuropathy. Presenting with pain and fever, his long leg plaster cast was removed and a sloughy, septic ulcer was discovered. His limb was oedematous and cellulitic up to knee level. Amputation was offered and declined.

Care Process

- Debride ulcer, “Intrasite” dressing, IV antibiotics, and hospitalisation
- PRAFO applied
- Slow progress first 6 weeks
- Infection eliminated by 10 weeks
- Granulating well, no slough, no pain after 12 weeks
- After 18 weeks change in dressing to “Honey & Tulle” (ulcer clean but healing static)
- After 22 weeks Allevyn Heel Cup applied
- At 32 weeks – contact dermatitis from Allevyn Heel Cup. Patient readmitted to hospital. “Honey & Cod Liver Tulle” applied to dermatitis. Covered with Aquacel, & Lantor followed by Allevyn Pad to absorb exudates. Oral antibiotics
- At 33 weeks improving – antibiotics continued
- At 40 weeks still on oral antibiotics. Ulcer reducing
- At 44 weeks PRAFO for night use; IPOS Rear Foot for day use
- At 50 weeks ulcer heeling well
- At 56 weeks heeled

Outcomes

Amputation was prevented although the heel took more than one year to heal. One PRAFO, was required through the process with liner changes as required. One IPOS hind-foot relief shoe was used from 44 weeks. The highest costs were associated with professional time, dressings and antibiotics.

Fig. 4 *Case B Initial presentation of right heel.*

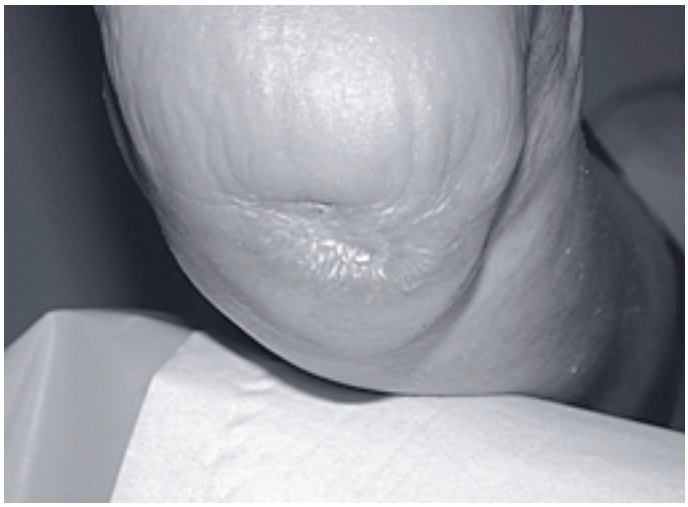

Fig. 5 *Case B at 56 weeks.*

Conclusion

These cases highlight situations where amputation or prolonged hospitalisation would be considered highly likely without orthotic intervention. Orthotic intervention with the PRAFO allowed protection and early mobilisation with early discharge from hospital.

The perception of some observers in the past has been that orthoses are relatively expensive. In our study, orthoses represented a very small proportion of the total treatment cost in terms of materials and professional time.

The clinical challenge is that once tissue break-down occurs significant time and resources are needed for the life of that limb. Frequently, the merits of ulcer prevention are acknowledged but effective strategies are often not in place. A hypothesis worthy of testing is that increased use of appropriate orthoses, with the intention of ulcer prevention, could be cost-effective in high risk groups.

Author contact information:
William A. Munro
8-10 Dunrobin Court
Clydebank
Glasgow G81 2QP
United Kingdom

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Sports

Sports – A Way to Activity and Joy of Life

Reporting by Handicap International

It is not because of the considerable attention of the media, focussed mainly on the "big events" like the Paralympic Games, that a NGO like Handicap International is engaged more and more in the field of sports for disabled people in non-industrialized

Volleyball in Cambodia
For several years, the support of sports activities, among others the equipment and the training of three volleyball–teams, has been part of our project in Cambodia. In the meantime, their athletes have done very well in national and international competitions. In January 2006, these teams and their association – the Cambodian Volleyball League (Disabled) CNVLD – have found private sponsors. So they do no longer need support from Handicap International – a welcome development and a fine success for this creational project.

countries. In poor and disadvantaged regions, people who are disabled because of war, accidents or severe illnesses have little opportunity of education or performance. Being forced to doing nothing and to being dependent on other members of the family discourages the disabled person and often aggravates this situation of poverty and isolation.

If, however, we can reinforce self-confidence and physical abilities, the chances for the future increase, too. One way to reach this aim are sports and therapeutic games because – apart from the physical performance – they also reinforce self-confidence and reveal ways to rehabilitation and integration. The aim of such activities is a complete active integration of disabled persons into public life.

Sports activities offer different chances:

– The normal rehabilitation is completed appropriately when people learn in sports exercises and games for example to move freely with a prosthesis or in a wheel chair.
– Social rehabilitation is supported: The team activity creates common grounds and the possibility for the individual to be promoted in a loyal surrounding and to perform.
– Because of their physical activity, people who are active in sports aren´t only more able to reduce tensions, but the sports activities also demand an engaged interaction with the people around them: to deal with the team, to make decisions and to find one´s own position.
– Sports competitions offer the possibility to stand up in public self-confidently: Here the persons concerned are seen as athletes and not in the first place as disabled persons.

To experience one´s own possibilities changes the image of the Ego and of one´s own body, possibilities can be perceived with a higher awareness and differences are more easily accepted.

The programme of Handicap International is to enable disabled people step by step to take part in sports activities. To reach this aim, the physical rehabilitation often is the starting point. From physical exercises, which are strenuous in the beginning, the joy of the game slowly develops. Beyond the therapy, the need may arise to exercise a certain discipline more intensively and to develop one´s capacities in it. Thus, the joy of the game often becomes an important leisure activity. As a consequence, a serious engagement often means a specialisation with the aim of being able to compete with others – and so the leisure activity may become a competitive sport.

Sports and Games for Children in Bangladesh
Only a few months ago, a new project was started in our programme in Bangladesh: The social abilities of handicapped children and youths shall be reinforced by sports activities. A team of national and foreign coaches and physiotherapists develops appropriate games and exercise units and teaches the staff of the local organisations for disabled persons. The necessary devices are furnished, and existing sports grounds are adjusted to the special needs of the young athletes. And naturally, the children and young people are supported therapeutically, so that they can have fun and success in doing the exercises and playing the games.

Basketball in a Wheelchair

In January, our programme examinor, Ms. Stefanie Ziegler, has carried out an evaluation in Togo, and there has come to know about the local sports project. In this context she also learned the history of Sambale Waliou.

Finally the great day has arrived: In Togo, participants and spectators are impatiently waiting for the opening of the National Paralympic Games, which take place, as every year, also in 2005. Athletes from all over Togo compete in different disciplines. Among them are the two teams of wheelchair-basketball of Sokodé and Lomé, who have been training for this event for weeks and months. In preparation of the competition, the players and their technical advisors are working on their wheelchairs to make them even quicker and more agile. Finally the game can begin: one last approving grab to the wheelchair and – here we go! Enthusisastic spectators from both cities encourage their respective team. All players fight hard and with high commitment; medical and technical companions make a successful game possible. For a long time the game is undecided, and both teams use every time out to discuss and improve their strategy. In the end, the team of Sokodé wins against the team of the capital.

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Beaming under the cheers and applause of the spectators, Sambale Waliou rolls from the field after the game. In his high spirits, his wheelchair tilts, but he catches it skilfully. This time they have really deserved the victory over the basketball-team of Lomé. There are not many opposing teams in Togo – actually only these two – and so the two teams have been trying their strengths against each other regularly since the end of the 1990s with alternating victory. The other players of the Sokodé team are also exhausted but happy, and they receive their medals. The problems of the preparations, the hard journey there, muscle ache and minor injuries are all forgotten. Every member of the team feels that the victory makes up for the efforts. The success is mirrored in the faces of the players; beaming, they start their victory party.

Sambale Waliou has been on the team of the wheelchair-basketballers from the beginning; but this is only one of his disciplines: He tries his limits in athletics as well as in weightlifting. His muscular trunk proves this clearly. Sambale was born in Sokodé, Central Togo, at the end of the 1970s. In early childhood, he fell ill with poliomyelitis and for this reason can use his two legs only in a very restricted way. His parents hesitated for a long time to even send him to school. When he finally went to elementary school, the teachers proved to be too inexperienced to give him an appropriate education. Sambale Waliou left school after only a few years, he could hardly read or write. Like many other badly educated and unlearned youths, he had to be contented with a simple trade and learned to do wickerwork. At the end of the 1990s, Sambale Waliou started to do sports systematically. He quickly made a name for himself, won in the National Paralympic Games in Kara in 1999, alike in 2002. 2003 became the year of his greatest triumph, when he took part in the Jeux de l´Avenir des Personnes Handicapées d´Afrique (JAPHAF) in Dakar/ Senegal as well as in the African Games in Abouja/ Nigeria and there won one of the three victory medals for Togo. Never before had the triumph of the victory and the disappointment over the consequences been so big: As a winner he had actually qualified for the participation in the Paralympic Games in Athens in 2004. But his financial situation did not allow him the journey to this important sports event.

Sambale Waliou, after the match.

Today, you can again meet Sambale Waliou every day at his place on the market of Sokodé, where he offers his wickerwork. At the moment he is planning to open a shop for wickerwork in Lomé together with some friends. He has not given up sports: He still takes part in regional and national competitions. In 2005 he won three medals in athletics and wheelchair-basketball – and hopes again to take part in the next Paralympic Games.

This report is by courtesy of Handicap International, Germany. Donations are welcome; for this purpose please contact Dr. Eva Maria Fischer at ***efischer@handicap-international.de***

The Togo Project

Apart from the project work in rehabilitation and orthopaedics as well as the creation of local structures, Handicap International also promotes sports activities in Togo:

– Regional sports associations, formed by local organisations of disabled persons, are supported.
– The Togolese Sports Federation for Disabled Persons FETOSPHA receives financial means for their coordinative tasks, for the organisation of national championships and the choice for the JAPHAF Games – a competition of the francophone states of West Africa.

Questionnaire

How do you like our international edition?

Your opinion about our international edition is important to us! Please take a little time and fill in the following questionnaire. It is only with your assistance that we can learn more about your needs! As a little thank-you for your efforts we raffle 5 copies of the bilingual edition of Nancy Hylton's "Dynamic Orthotic Concepts – Konzepte der dynamischen Orthetik" (Verlag Orthopädie-Technik, Dortmund 2000) among all entries that have reached us by January 15, 2007.

Please give marks for the following points (1 = excellent, 5 = poor).

1. How do you mark	1	2	3	4	5
Scientific character	❑	❑	❑	❑	❑
Practical value	❑	❑	❑	❑	❑
Comprehensibility	❑	❑	❑	❑	❑
Choice of topics	❑	❑	❑	❑	❑

2. Which specialist topics are of particular interest to you?

- ❑ Orthotics
- ❑ Prosthetics
- ❑ Rehabilitation technology
- ❑ Medical devices and medical technology
- ❑ Orthopaedics, medical topics
- ❑ Design, material and manufacturing procedures
- ❑ Other:

3. Which further topics are of interest to you?

- ❑ Health policy
- ❑ Foreign aid
- ❑ Professional training
- ❑ Portrait of the situation in individual countries
- ❑ Book reviews
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- ❑ Coverage of trade shows and congresses
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4. Would you be interested in subscribing to ORTHOPÄDIE-TECHNIK Quarterly?

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