

OBSERVATION OF THE FAILED INSTRUMENTATION OF THE SPINE

Dr. Prakit Tienboon
Department of Orthopaedics,
Chulalongkorn University Hospital, Bangkok, Thailand

The doubts of instrumentation after spine surgery is still one of the hot issue argument in orthopaedic surgery. But now, the tendency of spine instrumentation are used world wide and much more accepted than the pass There are so many types of the spinal implant systems in all over the world. But not one of these is approved by the FDA of USA. The exception is only the intervertebral disc cage that was approved and allowed to used in selected cases. This may be the problem of that implant itself, so it need some more knowledge or experiment before approved by FDA. At the present time there is no ideal instrument for spine fixation nor is one close to development, as far as I known there are many companies working to develop instruments. but each of these may have their own objectives. In my opinion, the ideal instrument for spine fixation should :

1. Give long lasting fixation of the spine at all times.
2. Allow normal spine motion at that segment.
3. Not interference with other part of the body.
4. Be safe and easy application.
5. Be inexpensive.

The first heading mean that after applying the implant in to the spine, all of the implant remains in the body at all times with no need for removal this means that the instrument functions forever without breakage, pull out, loosening or any complications of itself. **Lastly, the instrument should behave as a functional part or unit of the body.**

One of the most important ideal conditions to my mind is to manufacture a spine instrument that can be not only secured or well stabilized in the spine, but also allows that part of the spine to **move with a freedom as close to normal spine as possible** that is I would like the instrument to have the special character and function of flexible or movable unit. This is unfortunate that at the moment, all the implants on the market are for rigid fixation of the spine and do not allow motion of the fixed segment. There is one intervertebral disc prosthesis for intervertebral disc replacement that behaves almost close

to this criteria. There are quite a few reports of success but it is still not well known yet. Any way this prosthesis is in the experimental stage and not for marketing.

The spine instruments are used world wide and the application of each implant system, and basic knowledge about it must be learnt before performing the surgery, so the technique should be simple and safe that is any orthopaedist or neurosurgeon could apply the implant easily after passing the training course. From the literature reported, from consultation to me, and from my experience since 1979 untill now , I am aware of many complications of these spinal instrumentation from every part of the world, some of these were unexpected or even unbelievable. Any how results varied from surgeon to surgeon, implant to implant and patient to patient. Purposes of this presentation are to :

1. Talk about the complications after spine instrumentation
2. Precaution and avoid this complication
3. Try to fine the way to get the best method of surgery.

A list of spinal complications after instrumentation are as follows :

Screw complications

Screw Miss Place , Miss Pedicle, Miss Alignment
Breakage
Loose
Pull out
Too short, too long
Break pedicle
Cut trough bone
Sub cutaneous screw or under the skin

Rod complication

Rod breakage
Loose
Migration
Too short, Too long

Transverse rod alignment

Loose
Subcutaneous rod
Too much compression or distraction

Neurological complication

Nerve injuries
Dural tear, csf leakage

Paraparesis

Paralysis

Vascular complication

Injuries to vvs.

DVT.

Others complication

Non- Union

Miss Level

Infection

Further degenetation at above or below level of fusion

Death

Etc.

All of the complications mentioned above could occur at any time and in the hands of any surgeon. Some of the complications are fatal and some can disable the patient. To help prevent or avoid these complications, the following criteria should be concerned :

1. Correct diagnosis
2. Correct surgical approach
3. Correct and adequate level of fusion
4. Good and adequate neural decompression
5. Good implant
6. Good application
7. Good quality of bone
8. Good surgical skill
9. Good post-operative care

If one follows all of the criteria above, good or excellent results will be expected, but missing any one of the criteria may cause disastrous problems. In my review of all the cases of spinal instrumentation used at the Orthopaedic department, Chulalongkorn hospital, Bangkok, Thailand since 1979 up to now, more than 1600 cases were done by myself and many systems of implant were used, as follows :

1. A-O screw fixation	83	Cases
2. Harrington rod	50	Cases
3. Harrington rod plus sublamina wiring	44	Cases
4. Luque segmental fixation.	811	Cases
5. Combine harrington and luque sublamina wiring	49	Cases
6. Pedicular screw fixation		
6.1 Simple ao plate and screw.	15	Cases
6.2 Combined luque rod and ao plate.	45	Cases
6.3 Uss system.	2	Cases
6.4 CCD system.	351	Cases
6.5 Moss miami system.	25	Cases

7. Plif technique (Titanium mesh) with miami system.	125	Cases
Total	1600	Cases

Each type of implant has its own problem , but some have more than others. Up to now I still use almost all of the instruments mentions above. some intruments are used for specific disease. for example, A-O screw is used in cases of spondylolysis without displacement (Buck's). The ao plate and screw used for both anterior and posterior fixation. Plating posterior fixation via pedicle is used less and less because of poor biomechanics and frequent results. Only in cases of total laminectomy and of patients from poor socioeconomic backgrounds is it needed. Besides, the A-O plate is used in fixing the vertebral body anteriorly in combination with the alif technique.

The used of the harrington rod alone has been given up. But when combined with sublamina wiring , It has worked well in many cases of the fractured spine. In many cases I have combined harrington - luque rod and sublamina wiring on each side of the spine. One of the problems of sublamina wiring is that the sharp end of the wire may injure the finger of the surgeon. So in the era of aids one should be very careful. The luque rods are still used for patients from poor socioeconomic backgrounds. The rod are bended to become rectangular shape (hand made rectangular rod , hartshill system). It is used mostly in the lumbar spine in cases of degenerative disease. The results of rectangular rod fixation were good; as high as 91.5% (739 cases), and fair to poor in 8.5% (72 cases) the causes of poor results were

Wire breakag (Most Common)		
Wire Loose		
Non-Union (Second most common , combined with wire breakage)		
Nerve compression (From rod)	2	Cases
Infection	2	Cases
Rod migration	1	Cases
Bursitis with back pain		

One interesting thing is that the breakage or loosening of the wire did not mean non-union. But in cases of non-union, these two problems are usually found with those two problems I am aware of this because I have offen found a solid union in cases where wire loosening had occur. This condition is quite the same as founded loosening of the ccd screws fixation.

The ccd system of pedicular screw or screw-hook technique were used for 351 cases. All were combined with posterior, facet joints or postero-lateral bone graft. The various disease are shown below

Spondylolisthesis		
Lytic type	28	Cases
Degenerative type	97	Cases
Spinal stenosis	109	Cases
Unstable disc herniation	13	Cases
Degenerative scoliosis	52	Cases
Tumor	11	Cases
Fracture	12	Cases
Deformities		
Scoliosis	21	Cases
Kyphosis	8	Cases
ToTal	351	Cases

42 (11.96%) Out of 351 cases had the problems of

Screws loose	29	Cases
(Non-Union 8 Cases, Proved by Reoperation)		
Screw breakage	2	Cases (3 Screws)
Missing pedicle	3	Screws (3 Cases)
Cut through bone	2	Screws (2 Cases)
DVT	1	Case
Rod migration	1	Case
(Re fixed the rod)		
Rod shortening	1	Case
(Changing rod)		
Prominent screw head	2	Cases
Infection	1	Cases
(Open and drain , rod not remove, wound healed)		

This is our 4 year follow up since 1993. The final results of the CCD fixation were

Excellent and good	318 (90.6%)
Fair or satisfactory	31 (8.83%)
Poor	2 (0.57%)
(Pain from loosening screws and refused surgery)	

I have stopped using the CCD system because of its high cost relative to other systems and because the second generation, CD horizon will soon be on the market. Since april 1996 the moss miami system has been used. More than 125 cases have been performed, and the techniques have changed to a combination of plif and posterior fixation. Due to the short period of follow up (less than 1 year) , the final results can not be reported at the moment. But the out come of short follow up period for this technique is very good in all cases. There was only one case of screw breakage, which involved two screws, this was without symptom. The reason for the excellent results of this technique in my opinion are the corrected biomechanics of the implant

to the spine. The load transmission from the trunk pass along both the anterior and posterior spinal column. There was no screw loosening nor rod problem. Only the one case of screw breakage was seen which may caused from too short titanium mesh at that level producing unequal load sharing on the spinal columns.

The results of plif technique combining with posterior fixation is good. But the results of others instrumentations are not so bad, more than 90% of good results could be expected. As the technique of the first mension is much more difficult, time consuming for surgery and usually more bleeding, more expensive and need high skill surgeon to perform the operation, so what is the best of all these are some of the questions that I would like to have as answer:

1. Does all spine surgery need the plif technique and posterior fixation to get 100% results?
2. Is plif or alif alone enouge?
3. Why did most of the cases of posterior fixation alone ,the CCD group or rectangular rod group give good to excellent results more than 90% although it is less than the combination of the plif and posterior fixation, can we find out what is the difference between using plif and not using plif. Can we choose the most appropriate technique for each patient to get the same 100% results. The plif technique involves more extensive and dangerous surgery than posterior fixation alone. So if we know how to selecte cases for the most appropriate technique. We can reduce the cost, the operating time and the danger to the nerves. That is we can produced an easier operative procedure and lastly give good or excellent results every time. Which is what all surgeon want. How to get that?

CONCLUSION

This presentation is to talk about the ideal implant and criteria for surgeon to get a good results in doing spine surgery. It is not mean only using the instrumentation but also only the laminectomy alone. The plif technique combined with posterior fixation are more favorable than another methods in case needed instrumentation. The question for the future is that, when the plif? when not? and what going on after instrumentation. finally to get the best results nearly to 100% or exactly 100% , it need good surgical skill and experience, good implant, good patient (Good bone quality, no underlying diseases, aging and not so severe osteoporosis) and last of all good post operative care.