# Static Progressive Splinting for the stiff joint

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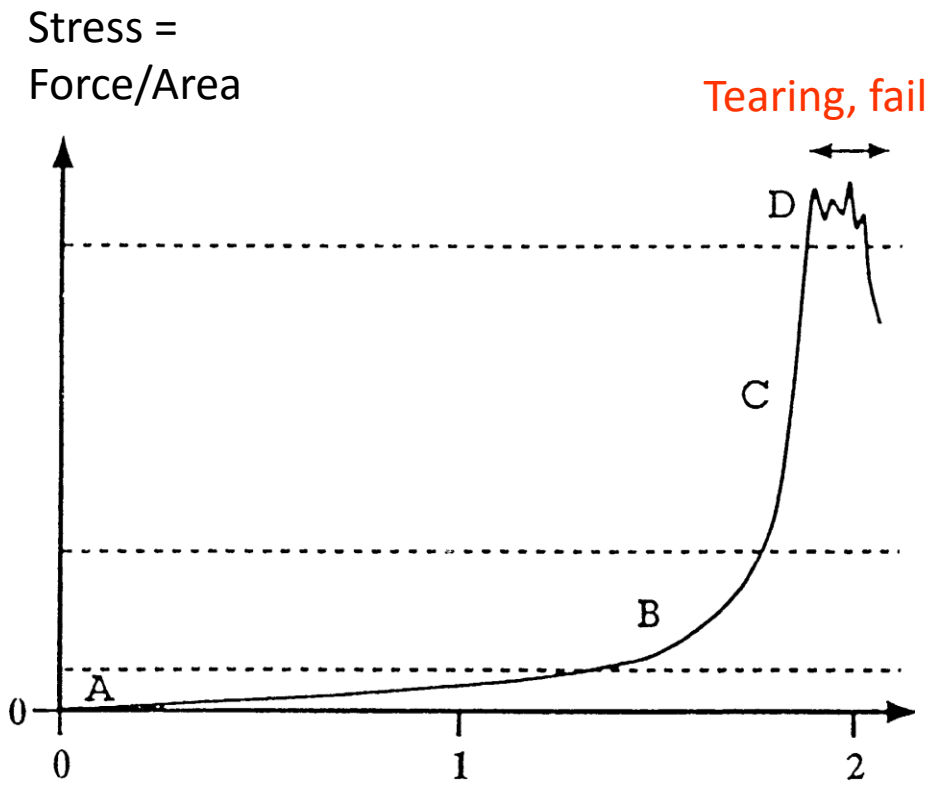
## Principles of mobilising a stiff joint using splinting techniques [1, 2, 3]

1. Keep joints moving – avoid stiffness. Only splint if you have to, for a defined clinical reason, for the minimum time possible.

2. Change the shortened tissues by growth – not stretch.

3. There are three variables in the application of splinting:
    1. Intensity of the physical force – how much force the splint applies to the stiff joint
    2. Duration of the splint use – how long is the splint worn in a session
    3. Frequency of splint use – how often is the splint used in a 24 hour period

## Stress/strain curve for soft tissues: [4]




A = Unfolding

B = Alignment

C = Stiffening

D = Failure - avoid at all costs!

4. Use low load force for a long period of time [5].

5. **Use high load force for a short period of time – static progressive splinting. (Bexon)**

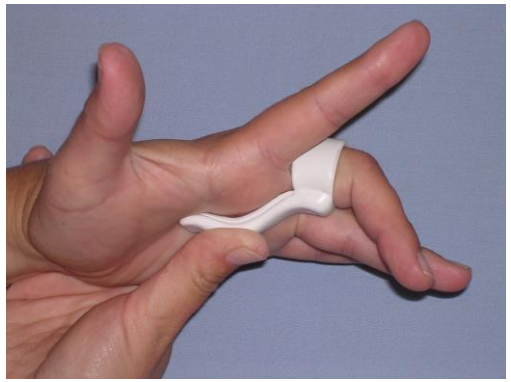
Use both these approaches together, to complement each other

# Definition of the four basic splint design concepts

**GREEN TEXT = splint designs that can be used to improve the stiff joint.**

**1. Static splints:**

- firm base.
- immobilise the joints that they cross (beware of prolonged immobilisation leading to stiffness!)
- can be used to improve passive joint range of movement through the application of low force over a long period of time, whilst holding the joint at the end range of passive movement. Improvement in passive range of movement can then translate to improvement in active range of movement.
- can be used to block one joint to facilitate active movement in another – torque transmission.
- can be used to facilitate function.

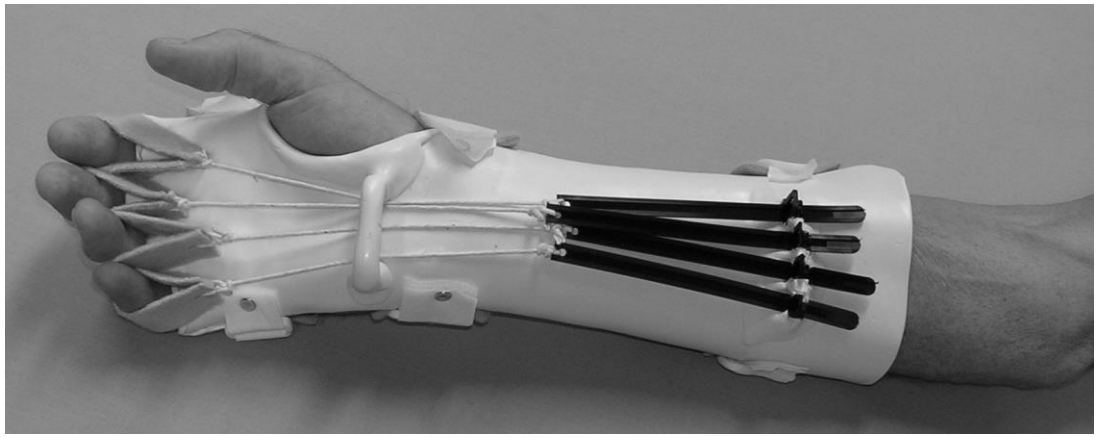


**2. Static serial splints: these build on the concept of static splint design by using materials that are easily remoulded to accommodate improvement in joint range of movement.**

- applied with the tissue at maximum length.
- worn for long periods to accommodate elongation of soft tissue.
- Remoulded, or remade, to increase range of movement across a joint.

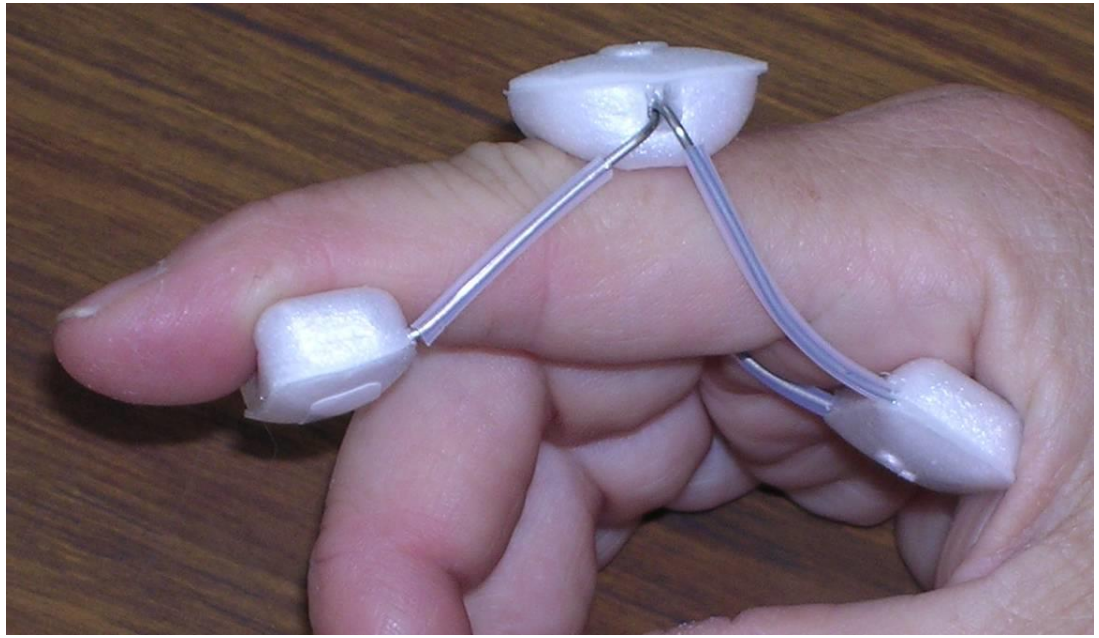
### 3. Static progressive splints: [5]

- used as an exercise splint – this is NOT a functional splint
- very useful to improve passive range of movement in an isolated, stiff joint, where other treatment approaches have failed – this should translate to improvement in active range of movement.
- use of inelastic components (e.g. pulleys, hooks, loop tape, string, static line) to apply force to a joint to statically position it, as close to the end range of the joint as possible.
- the system can be adjusted incrementally, by the patient, to increase the correction force, as the joint responds to treatment.
- useful for joints that have a “hard end feel”.
- very useful to apply high force over a short period of time BUT come with a major health warning!



## 4. Dynamic (lively): [6]

- the splint has components that move – e.g. elastic, springs.
- allows and facilitates movement in the joint (hand) that is splinted.
- useful for function e.g. following peripheral nerve injuries.
- strong correction forces across a joint may be lost in the moving components of the splint.
- however, the dynamic components may also self adjust as range of movement improves.



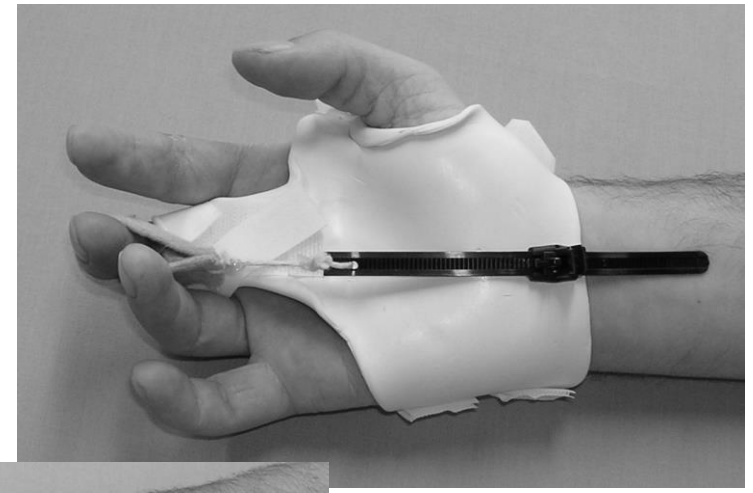
**Note: any splint could have elements of one or more these different designs combined together e.g. a splint to immobilise the MCP joint extension whilst having a static progressive component to improve passive PIP flexion.**

## Static Progressive Splinting: the health warning!

1. **Poor vascular supply** – not suitable in patients who have a compromised vascular supply e.g. following vessel repair, evidence of avascular necrosis, smokers.
2. **Bone and ligament damage or weakness** e.g. early stage fracture healing, unstable or intra-articular fractures, early ligament repair, heterotrophic ossification, loose body within joint.
3. **Poor skin integrity or quality** – high risk of creating pressure sores c.f. vascular supply.
4. **Acute inflammation** e.g. arthropathy.
5. **Infection.**
6. **Poorly compliant patient** – the patient must fully understand the clinical reasoning behind the use of the splint, the risks, how to adjust the splint and how long the splint should be worn. Static progressive splints deliver high force over a short time and should never be worn when the patient is asleep.
7. **Cognitive difficulties** – as for No.6

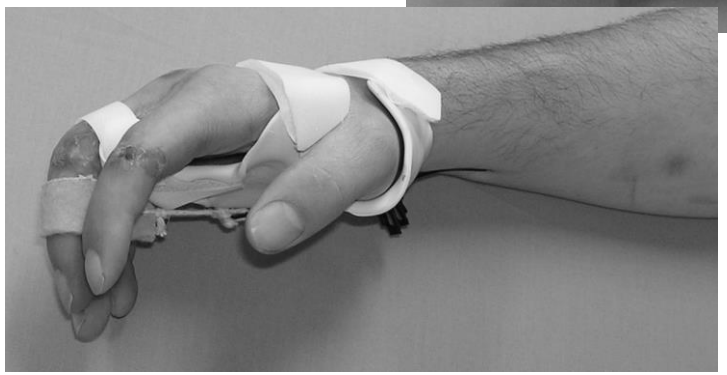
## Techniques for static progressive components

**Splint base** –likely to need to immobilise normal joints, to direct the correction force to the stiff joint.



Need materials that are rigid and can make strong bonds.

- Polyform
- Premium X-Lite



May need to pad the edges. e.g Rolyan contour foam.

Accurate strapping to direct force.

## Techniques for static progressive components

**Slings** –moleskin, leather,  Velcro, commercial Fabrifoam slings, Rolyan SoftStrap™ or equivalent, thermoplastic (1.2mm Orfit or Orfilight) lined with moleskin.

Will need to reinforce the eye, to prevent tearing e.g. with 1.2mm Orfit.

Sling must be applied at 90° vertical to prevent slippage and shear forces.

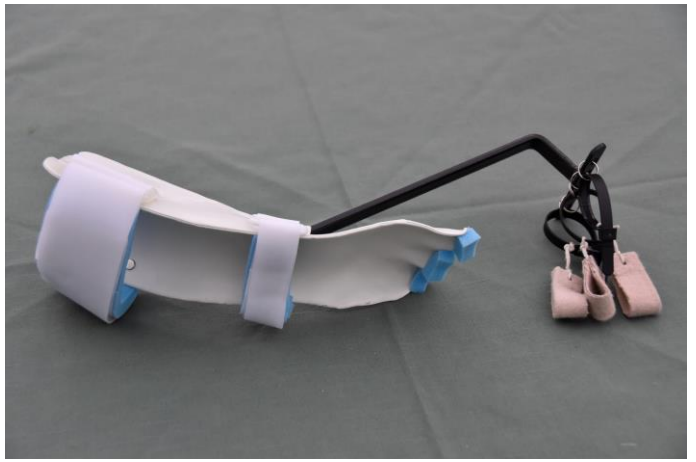
Make sure that the edges of the sling are soft – caution with Velcro and thermoplastic materials.

## Techniques for static progressive components

**Pulleys and outriggers** - used to direct correction force.

Pulleys: Velcro and rivets, thermoplastic, D-rings

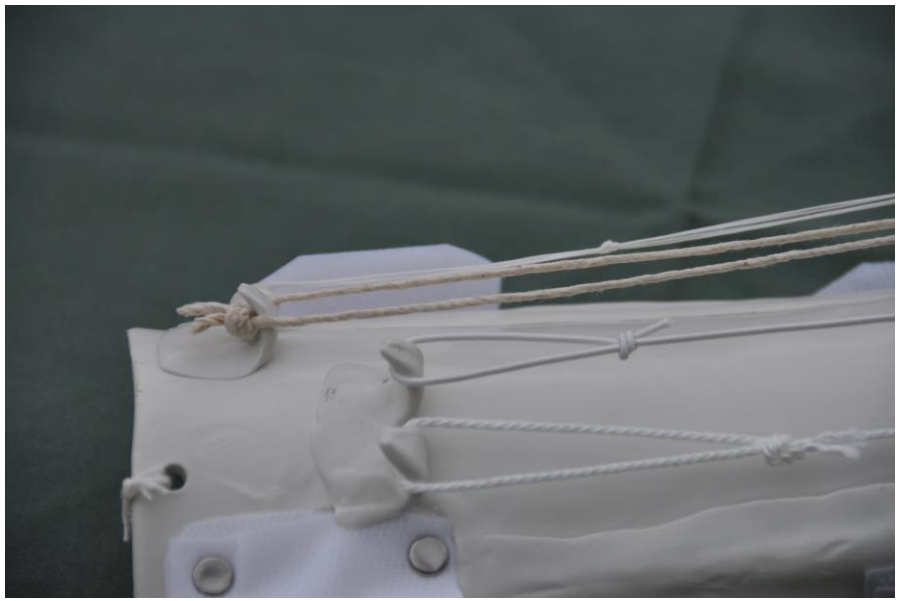
Outriggers: Orfitube, metal

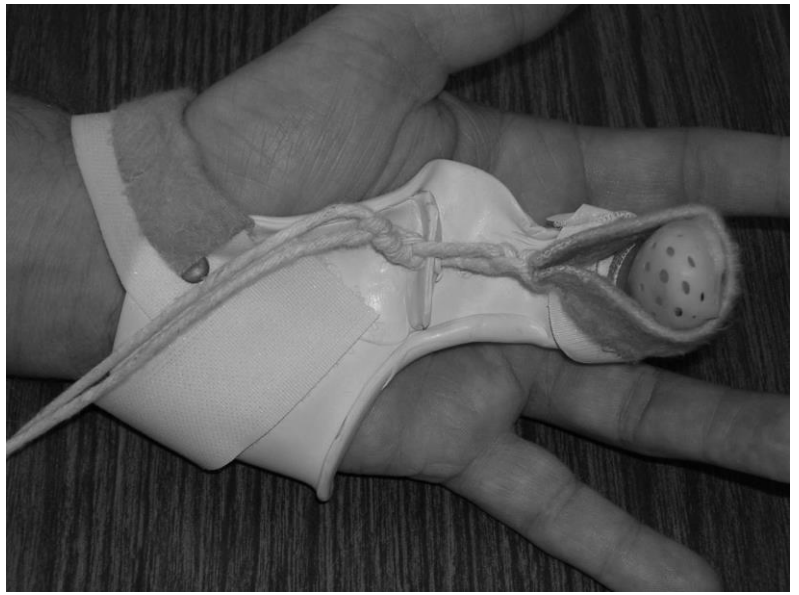


## Techniques for static progressive components

**Static line** e.g. string, nylon line –to deliver force.

Caution when using elastic – you can lose the correction force.





## Techniques for static progressive components

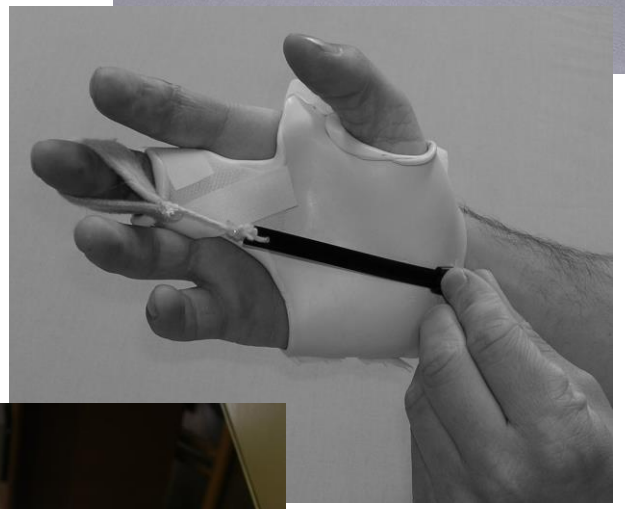
**To adjust the force** to accommodate change in the stiff joint:

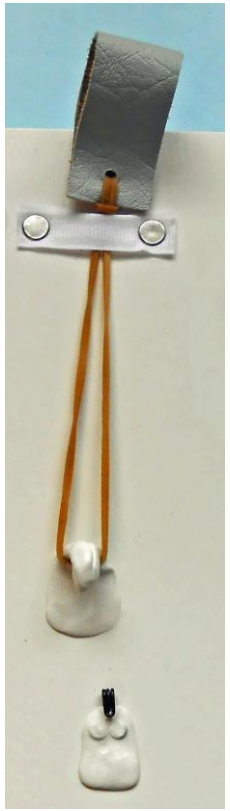
Knots

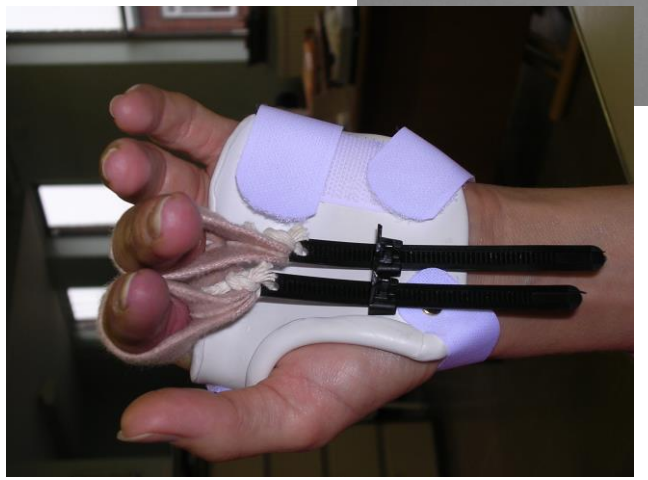
Releasable cable ties [7]

Velcro

Staged thermoplastic hooks





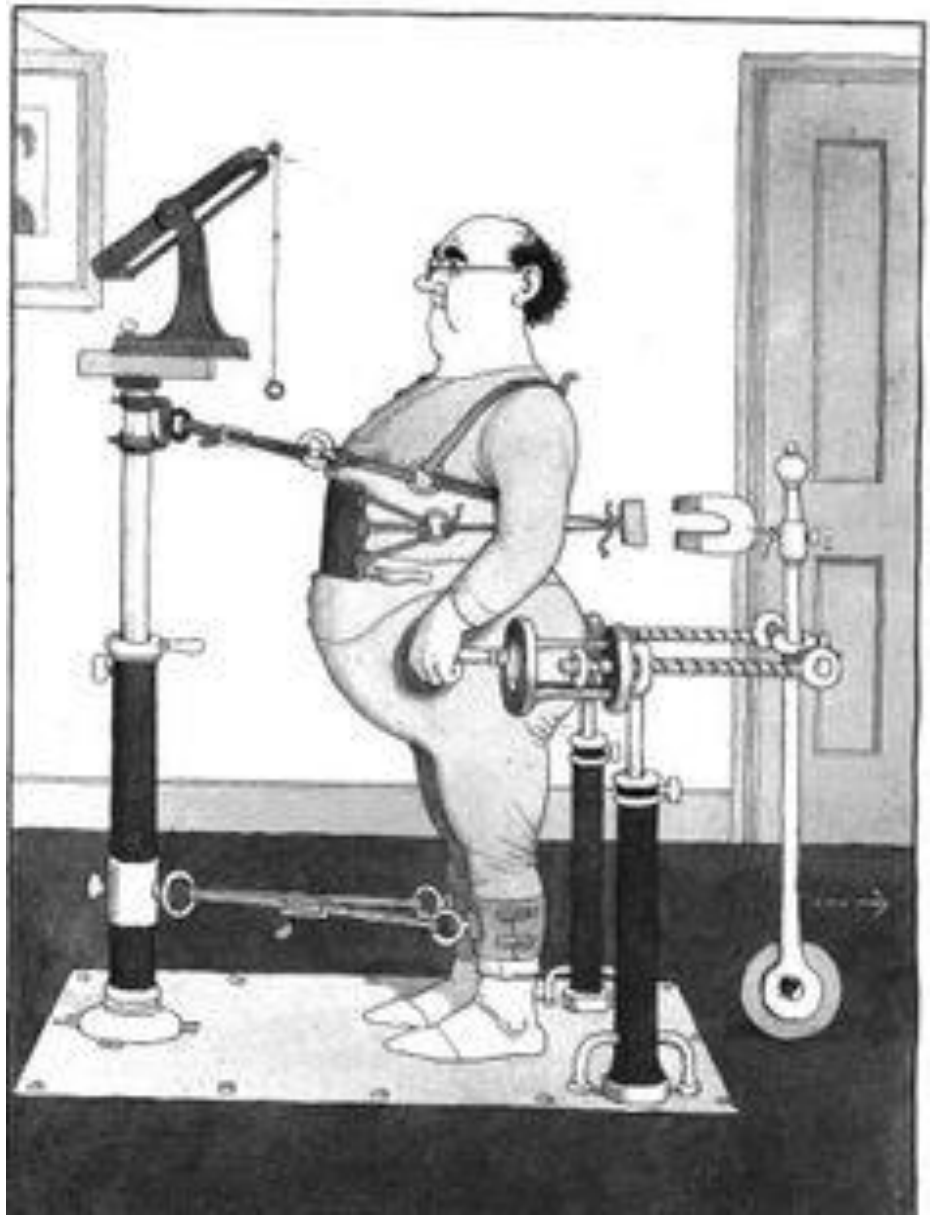


## Most important:

## IMAGINATION AND

## CREATIVITY!

## AND GREAT FUN!!



**P.S. Static progressive splints do often end up looking like instruments of torture!**

## References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## Further reading


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