<table>
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<th>ZAP-X® GYROSCOPIC RADIOSURGERY™</th>
<th>COBALT-60 RADIOSURGERY</th>
<th>CONVENTIONAL &amp; ROBOTIC RADIOSURGERY</th>
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</table>
| **Shielding & Vault Requirements** | Requires costly shielded treatment vault in all instances.  
In most settings, eliminates the need for costly radiation vaults.  
ZAP-X makes it feasible for simple point-of-care installation at virtually any location, including satellite facilities, physician offices and outpatient surgery centers. | Requires costly shielded treatment vault in all instances.  
Necessitates significant security infrastructure.  
Requires costly shielded treatment vault in all instances.  
Full-body application adds complexity, elevating the need for significant staffing, rigorous training, and resource-intensive QA.  
Related complexities may introduce additional risks of mechanical and human error. |
| **SRS Applications** | - Brain  
- Head  
- Neck | - Brain  
- Head  
- Neck  
- Anywhere in the body  
Full-body application adds complexity, elevating the need for significant staffing, rigorous training, and resource-intensive QA.  
Related complexities may introduce additional risks of mechanical and human error. |
| **Immmobilization** | Frameless, non-invasive thermoplastic mask immobilization.  
ZAP-X enables simple fractionation when clinically indicated. Frameless scan-plan-treat workflow can be broken into independent steps, enabling brief patient-friendly outpatient visits. | Primarily invasive stereotactic frame immobilization.  
Contiguous scan-plan-treat workflow requires full-day, on-site patient care.  
Optional frameless capability available for some indications.  
Primarily thermoplastic mask immobilization.  
May accommodate rigid stereotactic frames for some indications. |
| **Target Localization** | 3D patient registration achieved via an integrated planar kilovolt (kV) imaging system.  
ZAP-X provides image guidance with automated re-alignment both prior to and throughout each radiosurgical treatment. | Mechanical triangulation via rigid stereotactic frame.  
In most cases, provides no intra-fraction image guidance.  
Potential target shifts likely to remain undetected, which may result in exposure to surrounding healthy structures.  
Conventional Radiosurgery:  
Provides cone-beam CT setup image guidance; standard configuration does not provide intra-fraction target imaging or guidance.  
Robotic Radiosurgery:  
Provides continual intra-fraction kV image guidance and automated re-alignment throughout each treatment. |
| **Treatment Delivery** | Source:  
1500 MU/min linear accelerator.  
Energy:  
3MV - Provides optimal dose coverage for intracranial targets while minimizing whole brain dose; sharpens steep dose gradient necessary for SRS.  
Source Axis Distance (SAD):  
45cm – Reduces geometric beam penumbra, sharpens steep dose gradient necessary for SRS.  
ZAP-X optimizes all aspects of beam delivery to the unique requirements of cranial radiosurgery. | Source:  
192 cobalt-60 radioactive sources.  
Dose rate ~300MU/min maximum, depending on source age. Sources must be replaced approximately every 5 years. Requires heavy regulation, bureaucratic licensing and continuous heightened security burden.  
Energy:  
~4MV (effective equivalent).  
Source Axis Distance (SAD):  
~40–60cm (varies based on model, source sectors used). | Source:  
1000-2400 MU/min linear accelerator.  
Energy:  
6-10MV - Higher energy pushes dose gradient away from the target, while producing additional radiation scatter and non-therapeutic patient dose. May result in additional exposure to surrounding healthy structures.  
Source Axis Distance (SAD):  
80–100cm - Larger SAD degrades geometric beam penumbra, pushing dose gradient away from the target. |
| **Beam Collimation** | 8 automated spherical collimators (4mm - 25mm).  
Tungsten-encased collimator lowers radiation leakage to less than 0.01% of the primary radiation beam.  
ZAP-X provides significant reduction in peripheral patient dose as compared to conventional and robotic radiosurgery systems. | Automated 4, 8, and 16mm cones.  
Conventional Radiosurgery:  
Multi-leaf collimator or optional 7 spherical cones (4mm - 17.5mm).  
Robotic Radiosurgery:  
Multi-leaf collimator or optional 12 spherical cones (5mm - 60mm). |
| **Dosimetry Validation** | Factory commissioned MV image detector provides a real-time, independently calibrated check of the administered dose.  
ZAP-X employs a novel fail-safe mechanism for mitigating the risks of potential mechanical and human error. | No real-time or offline dosimetry capabilities.  
Conventional Radiosurgery:  
Optional electronic portal imaging devices (EPID) require complex commissioning and may provide limited offline dosimetry capabilities.  
Such subsystems have seen very limited clinical acceptance to date.  
Robotic Radiosurgery:  
No real-time or offline dosimetry capabilities. |