

**TECHNICAL NOTE ARTICLE****Use of Hardware Battery Drill in Orthopedic Surgery**

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**Abstract**

Among the power drills (Electrical/ Pneumatic/Battery) used in Orthopedic surgery, battery drill has got several advantages. Surgeons in low resource settings could not routinely use Orthopedic battery drills (OBD) due to the prohibitive cost of good drills or poor quality of other drills. "Hardware" or Engineering battery drill (HBD) is a viable alternative to OBD. HBD is easy to procure, rugged in nature, easy to maintain, durable, easily serviceable and 70 to 75 times cheaper than the standard high end OBD. We consider HBD as one of the cost effective equipment in Orthopedic operation theatres.

**Keywords:** Battery drill, Cordless drill, Power drill

**Introduction**

Power drills used in Orthopedic surgery can be categorized into three types: Electrical, Pneumatic and Battery. Battery drill has distinct advantages over other systems, but commercial Orthopedic Battery drills (OBD) are very costly. This article discusses the use of economically viable "Hardware" / Engineering battery drill (HBD) in orthopedic surgery. While personally interacting with several orthopedic surgeons, the authors have noticed that some were using HBD regularly and were quite comfortable, while some were very skeptical. We could not find any article in English literature discussing the use of HBD in Orthopedic surgery.

**Technical note**

The prototype of HBD used by the authors is from Bosch company [Figure 1]. The HBD has got a plastic body and handpiece. The body has mouth piece with three jaws that holds the drill bit or K wire. The mouth piece can be hand opened and closed easily without the usual cumbersome Jacobson chuck and key.

The hand piece is ergonomically designed with detachable battery at the bottom end. The speed adjustment is done with finger trigger in the hand piece. The forward and backward drilling options are with separate push buttons on either side just above the finger trigger. There is another speed adjustment at the top surface of the hand piece marked 1 and 2 for slow and high speed respectively. All

adjustment buttons are conveniently marked in orange/red color for easy identification.

The HBD along with the battery comes in a mobile plastic case. Formalin tablets are placed inside this case to maintain the sterility of the drill. At the time of surgery, the drill is taken out of the box, a sterile stockinette cloth is slid over and used [Figure 2]. After usage, the stockinette is removed, blood if any is wiped off with saline. Special care is taken to clean the mouth piece after complete opening and closure of the jaws. The entire drill is wiped with spirit or alcohol based agent and again placed inside the case and locked.

**Discussion**

The electrical drill system (EDS) or pneumatic drill system (PDS) require an extraneous source for power supply i.e., electrical supply and compressed gas respectively. While both EDS and PDS are cheaper than OBD, they have got hose/ wires that impede the free mobility of the drill or surgeon.

The greatest advantage of battery drill is the ease of maneuvering the drill in required directions in the absence of hose or wire. Both the drill and surgeon can move around aiming for the correct angulation. The battery drill do not depend on external power supply, the spare batteries are readily available on table.

However the cost of standard OBD is prohibitive. HBD system is an excellent alternative available at a cost of

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Figure 1. Hardware battery drill - Bosch company.

around 7,000 Indian rupees (100 US dollars) which is approximately 70 to 75 times cheaper than the standard OBD and approximately 20 to 35 times cheaper than EDS and PDS.

The general apprehensions about using HBD in

orthopedic surgery were: sterility, crudeness of the drill, utility and maintenance of the system.

**Sterility:** Because of the plastic body and iron inner parts, the HBD is non autoclavable. The sterility part has to be taken care of as mentioned in technical note section. The plastic case (in which HBD is placed ) itself is cleaned periodically with alcohol based solutions.

**Crudeness of the drill:** The general perception is that the "power"/ "RPM" of HBD could be inappropriate for bone use resulting in splintering/ overheat generation etc. With excellent speed control, HBD can be used as gentle as required. The RPM of stryker 5 or 6 OBD system is same or more than that of HBD system. In fact, a low voltage low RPM drill with RPM less than 700 can be selected with HBD system while the RPM of "small battery" OBD system is more than 1000. The drill rarely gets heated up, the weight of the HBD is same as that of OBD (1) [ Table 1].

**Utility:** With its ergonomical design and light weight, HBD can be easily handled for routine procedures like K wiring, drilling, tapping, screw driving and reaming. With HBD the bone tap insertion (forward trigger) and removal (backward trigger) is extremely quick. The surgeon can have the luxury of having two or three HBD at time of surgery one each for drilling, tapping and screw driving, which can considerably reduce the total operation theatre time.

**Maintenance:** The HBD is designed for "hard" use in wood/ stone etc and hence robust. With its relative soft use in Orthopedic surgery, drill malfunctioning is rare. The HBD is simple to maintain, no routine oiling or inner cleaning is necessary. In 15 years of usage, we have come across two incidences of drill malfunctioning, which got serviced within 24 hours.

The disadvantages of HBD compared to OBD are: 1) The HBD cannot be used for cannulated reaming or drilling.



Figure 2. Bosch drill covered with stockinette just before the surgery.

**Table 1. Comparison of Hardware battery drill (HBD) and Orthopedic battery drill (OBD)**

No.	Parameter	HBD (Bosch)	OBD ( Stryker system 6)
I	Procurement		
1	Cost( Indian rupees)	7000 - 7500	450,000 - 500,000
2	Availability	Immediately available	Need to wait 4-12 weeks
II	Work parameters		
1	Weight of drill with battery (kg)	1.3 to 1.5	1.7
2	Speed: RPM (Battery Voltage - Volts)	250 -700 (7.2) 400 - 1000 (9.6) 400 - 1200 (12)	1050 - 1200 ( 9.6 - 9.9)
3	Battery Capacity (Ah)	1.5	2.2
4	Torque (Nm)	1 - 7	3.95 - 4.6
III	Usage		
1	Quick coupling of k wires /drill bit/ taps	Yes	Yes
2	Working Maneuverability	Good	Good
3	Cannulated drill or reaming	Limited , used in selected surgeries	All surgeries
IV	Maintenance		
1	Sterility	Formalin chamber	Flash autoclave
2	Robustness	Good	Good
3	Service centers	All cities	Few metropolitan cities
4	Cost of servicing/ repairing	Low	Very high
5	Annual maintenance contract cost	Not required	High

Ah = Ampere-hour, Nm = Newton metre, RPM = Revolutions per minute

It is possible in some situations where the guide wire is short and reamer is long eg. Sliding hip screw triple reaming. 2) A swift K wire drive (Pin collet system) cannot be attached . However K wires can be easily attached and removed with "keyless" tightening system. 3)The HBD system do not have a 'paired' power saw system.

In summary, hardware battery drill has got several advantages of a high end Orthopedic battery drill. The major disadvantage is the non cannulated system. With its minimal cost, high functions, ease of use, simple maintenance, high longevity and absence of any presumed "surgical" complications, we approve and recommend routine use of HBD by the needy Orthopedic surgeons in low resource settings.

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